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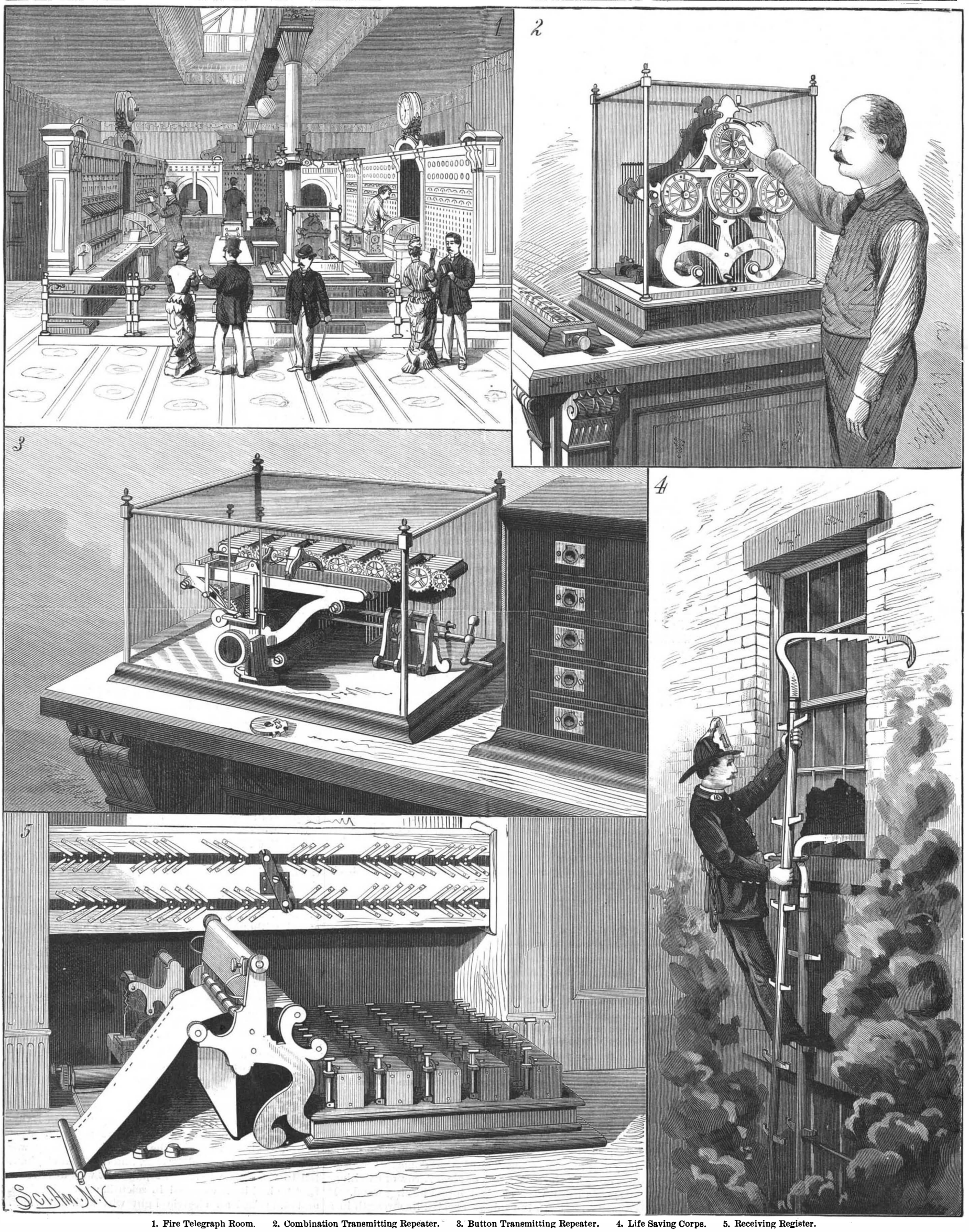

1. Fire Telegraph Room. 2. Combination Transmitting Repeater. 3. Button Transmitting Repeater. 4. Life Saving Corps. 5. Receiving Register.

NEW HEADQUARTERS OF THE FIRE DEPARTMENT OF THE CITY OF NEW YORK.—[See page 68.]

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NEW YORK, SATURDAY, JULY 30, 1887.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 604,

For the Week Ending July 30, 1887.

Price 10 cents. For sale by all newsdealers.

THE INTERNATIONAL YACHT RACE.

The new British yacht Thistle, portrait of which we published in our paper for July 2, was to leave for New York on July 25. She takes a crew of forty men. Her owner and her captain are sanguine that she will win the America's cup. This vessel appears to have sailed faster than any yacht heretofore built in Great Britain. The new American yacht Volunteer will probably be the competitor of the Thistle. The Volunteer had her first preliminary trial at Boston on the 21st of July, when she exhibited remarkably fast sailing qualities, and gave rise to an expectation that she would beat the Thistle. The Volunteer is of steel. On this trial trip she easily distanced the Priscilla and the Bedouin, both distinguished for superior speed. The international contest is to come off on September 26.

POSITIONS OF THE PLANETS IN AUGUST.

VENUS

is evening star. There is no need of pointing out her position in the western sky, for observers will recognize her at a glance as the largest and most beautiful star in the whole heavens. She will increase in splendor until the 15th, when she reaches her period of greatest brilliancy, and will approach the sun and set earlier every night during the month. On the 1st she sets at a quarter before 9 o'clock in the evening, an hour and a half after the sun. On the 31st she sets at a quarter before 7 o'clock, about a half hour after the sun.

JUPITER

is evening star. He may be found in the west, and is only exceeded in brightness by his fair rival Venus. He is in the constellation Virgo, and the brilliant star west of him, from which he is slowly receding, is Spica, or Alpha Virginis. Jupiter is approaching the sun, and sets on the 1st at a quarter after 10 o'clock in the evening; on the 31st he sets about half past 8 o'clock.

URANUS

is evening star. He is in the constellation Virgo, is approaching the sun, and is too far from the earth to be visible to the naked eye. He sets on the 1st about half past 9 o'clock in the evening; on the 31st he sets at half past seven o'clock.

MERCURY

is morning star. He reaches his greatest western elongation, or most distant point from the sun, on the 16th, and is, at that time, and for a few days before and after, visible to the naked eye. On the 16th he rises an hour and a half before the sun. He may then be found, at 4 o'clock in the east, about 4° north of the sunrise point. Mercury rises on the 1st soon after 4 o'clock. On the 31st he rises at half past 4 o'clock.

SATURN

is morning star. He is still near the sun, but is emerging from the solar rays, and at the end of the month rises more than three hours before the sun. He may be found among the stars of Cancer, southeast of Castor and Pollux, rising on the 1st about 4 o'clock in the morning, and on the 31st about 2 o'clock.

NEPTUNE

is morning star. He is in quadrature with the sun on the 23d. He is only visible in a powerful telescope, where he may be found in the constellation Taurus, south of the Pleiades, rising on the 1st shortly before midnight, and on the 31st a quarter before 10 o'clock in the evening.

MARS

is morning star, but is so small in size and luster as to be of little account. He is in the constellation Gemini, rising on the 1st about half past 2 o'clock in the morning, and on the 31st a few minutes after 2 o'clock.

Powder Ignited by Lightning.

On the 21st of July, at 2:30 A.M., at Streator, Ill., a mining town, a stroke of lightning struck the powder in the powder house of the Chicago, Wilmington, and Vermillion Coal Co., located half a mile from the center of the town. Ten tons of powder were instantly exploded with disastrous results. Fifty buildings were demolished; but only one person was killed—struck when asleep by a flying brick. Many people were slightly injured.

A terrific peal of thunder was followed by a rocking and swaying of the earth and a sweeping rush of air which made buildings totter on their foundations as if on the crest of a seismic wave.

Brick and debris were hurled in all directions for several hundred yards with such violence as to penetrate the walls of buildings, and dwellings nearly a quarter of a mile from the scene of the explosion were riddled as if by grape and canister. The greatest damage, however, was done by the concussion of air. A row of dwellings 100 yards away were crushed into kindling wood. It seemed as if the atmosphere exerted its strength in a downward direction, and crushed the buildings to the earth.

Blockades under Existing Conditions of Warfare.

At the Royal United Service Institution, recently, a lecture on this subject was given by Rear-Admiral P. H. Colomb, who, we may remark, is a gold medalist of the Institution. The chair was taken by Admiral the Rt. Hon. S. A. Cooper-Key, G.C.B. Admiral Colomb gave a very interesting account of the various blockading experiences from the time of Nelson and the Spanish blockade to the war between the North and South Americans. The latter was specially drawn upon as showing the most recent and instructive operations. The lesson learnt from these experiences shows that if the naval forces of England should have to engage in blockading operations against a naval power, they would, in the first instance, be liable to the attacks similar to those which the Federals experienced. But the particular force which promises to interfere most with blockaders is that of torpedo boats, not torpedo vessels; for if torpedo vessels are to take a large place in war, they will take it in the open sea, and as the equals of any other form of open sea naval force. That is to say, they will be the rivals of the fleet ship as at present developed, and aim themselves at becoming the fleet ships of the future, as claimed by M. Gabriel Charmes.

But the torpedo boat does not in any way claim to take the place of the fleet ship. It tends to operate outward from the land, and not inward from the sea. It is more a prospective terror than an open match for the ironclad; and its cheapness, combined with its assumed destructive powers, make it especially the weapon proposed for the driving off of masking or observing forces in the operations of blockade. It is not uncommon to hear naval officers express the opinion that the torpedo boat has made blockade a thing of the past. A well reasoned judgment cannot, however, accept this view. If the Confederate ports had swarmed with torpedo boats, the in-shore squadrons could not have been safely so numerous, nor could they have pressed in so closely nor so perseveringly. To us the sealing up of the enemy's ports can rarely be the object. We are not in a position to attempt such a thing with any country, and consequently our blockade will seldom extend beyond masking and observing—to measures of defense, not of attack. A single observing ship close in to the port, designed to evade the most modern forms of attack, and with her signaling powers developed to the utmost, is all that is necessary for all purposes of observing, when she is in communication with the real force off-shore.

The bases of such observing ships are the new "torpedo catchers." They have a speed which makes the actual attack of torpedo boats remote; a draught of water enabling them to press into the shallows, and rendering the chances of a blow from the locomotive torpedo uncertain. Three or four of such vessels forming an in-shore squadron, always closing in and lying quiet at night, and drawing off as daylight breaks in the morning, would keep quite as close a watch on the egress of the enemy as the numerous vessels of the Federals were able to do. They would be powerless to prevent ingress, but that would be immaterial to us. In the case of vessels or squadrons attempting to escape by night, it would be less the duty of these ships to engage them than to hang on their flanks and continually report their movements by signal to the off-shore squadron, which would detach and concentrate sufficient force to intercept the runaways. If the in-shore observers were attacked either by like forces, or such as might be supposed superior, they would either fight them or draw them off, taking care, however, that some of their number should evade action for the purpose of keeping up the watch.

No doubt the work of these observers would require all the skill, daring, and perseverance that the navy has always been accustomed to show, but it would not be of the harassing character which those of the Federal in-shore squadrons was. And this, simply because they would be relieved of the anxieties due to watching ingress. The fleet proper need not expect every kind of attack without notice. If its watchers fail to keep it warned, there is practically only the torpedo boat attack which can be delivered as a surprise. In this attack, the net defense, though perhaps not a perfect one, is yet a considerable safeguard. A torpedo boat flotilla will not quit the harbor for the attack unless there be some reasonable hope of finding the off-shore fleet, and this need not disclose itself except in answering the signals of the in-shore observers. But this disclosure presupposes warning, and is so much against the hopes of the torpedo boat flotilla.

Shocking an Elephant.

The great elephant Chief, who forms a part of the "pageant of victory" in the play "Fall of Babylon," met with a curious misfortune recently. Just as he was about to go on the stage, the company was startled with a tremendous roar, and the great elephant fell to the stage writhing in pain. It was discovered that he had been engaged in scientific investigations, and had seized an electric light wire with his trunk. He received a severe shock, and his trunk was considerably burned, but he was not otherwise injured.

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The Aurora as Seen in Alaska.

Lieut. Ray, in his report to the government on the International Polar Expedition to Point Barrow, Alaska, says: "Every clear night, the sky was illuminated by the most beautiful displays of aurora it has ever been my fortune to witness. They always commenced in the northeast and northwest, and seemed to spring from a dark, low bank of clouds. The lights were never stationary for a single second, neither did they ever take the form of bows or arches, so often seen in other latitudes, but great curtains of light, flashing with all the prismatic colors, seemed to be drawn across the heavens, ever rising and changing, and often culminating in a corona at the zenith, and falling like a shower of meteoric fire. As the winter advanced, these displays were more brilliant, and were always of a character that defies description, either by pen or pencil, as they were never for two seconds alike. They were unaccompanied by any sound so far as we were able to observe, and the deathly stillness that always prevails in this region when the sea is closed gave us an excellent opportunity to detect any sound, had there been any."

Lieut. Ray thus more specifically describes one of these auroras—one of the most magnificent displays that he observed, and which occurred December 8, 1881:

The "first appearance was in the S. and S.E., and for several hours nothing appeared but a few pale arches and bands, which had no remarkable features worthy of notice, except the rapidity with which they changed their position and character. They appeared, faded, and reappeared in various parts of the sky so quickly that it was very difficult to localize them. At 2.40 A. M., a narrow, greenish yellow arch, with a beautiful rosy fringe, developed in the S S.E., and, in a few minutes, extended through Taurus, Cassiopeia, and Cygnus down to the N., and for about ten minutes displayed some extremely beautiful tints, especially along its northern half. It seemed to be composed of an infinite number of short rays in a condition of intense vibration, the motion being principally in the direction of its length, while flashes of the most vivid coloring beamed out in the most bewildering variety. At the same time, numerous rays and patches of quivering light appeared in various parts of the sky in quick succession, dancing and gyrating to and fro, swift as the lightning flash. While the northern half of the arch remained thus brilliant, the southern half faded away. A few minutes afterward, a patch of rosy, greenish light appeared in the middle of Orion, and, in a minute or two, developed into numerous sheaves of rays with the greatest variety and intensity of motion, and displaying the most brilliant colors as they rose and converged to a point close to the star Algol, forming an imperfect but most brilliant corona, which swayed and swirled and eddied around our zenith with a kaleidoscopic magnificence utterly indescribable. The changes of tint, aspect, and position were so rapid and numerous that the eye strove to follow their bewildering confusion in vain. The general motion was to the N., though a brilliant curtain was at the same time moving toward the zenith from the N. The brilliance of the moon seemed to have little effect on the intensity of the colors which appeared. The colors were very numerous. Orange, yellow, rose, ruby-red, peach blossom, emerald green, and numerous intermediate tints changed and interchanged in beautiful confusion. The whole phenomena of waving wreaths, flickering flames, rays, curtains, fringes, bands, and flashing colors, the strange confusion of light and motion, presented a picture of which words can convey a very poor idea. The whole display lasted about thirty minutes. There was also intense magnetic disturbance during this time, the needles being almost unmanageable.

"The peculiarity of this aurora was its lowness in the atmosphere, several patches of cloud, apparently not very elevated, appearing far above it. It did not entirely disappear until about twelve, midday."

An Old Field for New Inventors.

The surprising announcement comes from Washington that the special board of officers appointed to inquire into the comparative merits of different lifeboats for use in the navy has reported to Secretary Whitney that it has found no lifeboat which can be recommended.

This indicates that the lifeboats used in the merchant service must be much less safe and advantageous in time of peril than is commonly supposed. Perhaps, indeed, many of them are not entitled to be called lifeboats.

The Secretary of the Navy has directed a continuance of the investigation on the subject, but, whatever conclusion is finally reached, enough has already been developed to show that lifeboats are capable of great improvement, and that a thoroughly satisfactory lifeboat is yet to be devised.

Here is a fine field for the exercise of inventive talent for the benefit of humanity. It may safely be predicted that the inventor of a real lifeboat worthy of the name will gain a distinction equal to that of the inventor of the miners' safety lamp.—*N. Y. Sun.*

Weight Carried by German Infantry.

The maximum and minimum weights in the new approved forms of equipment to be supplied to the German infantry have been arranged by the authorities at Berlin. The Bavarian forces, as usual in most of the military innovations made of late beyond the Rhine, will be suited first, and although the fact is clear, the reasons for the warlike preparations in this kingdom before the rest of Germany are not immediately apparent. The heavier burden of the equipments of two sizes, it is expressly stated, is only to be served out to men whose physical conformation and powers are found superior to the average, a disposition in itself a proof of the extreme care and solicitude of the German commanders for their followers in the ranks. Taking the basis of 28 grammes to the ounce, and 428 grammes to the English lb., the weights of the different items of equipment can be closely determined: Knapsack and fittings, of maximum scale, 1,170 grs.; belt, waist plate, and frog for bayonet sheath, 399 grs.; three cartridge pouches and straps, 1,015 grs.; pair laced shoes, 1,200 grs.; helmet and mountings, 495 grs.; camp utensils, 735 grs.; brushes and housewife, 600 grs.; and biscuit bag, 300 grs.; or 6,514 grammes in all. But to estimate the full weight carried by the German infantryman in heavy marching order must be added his rifle, which weighs 4,600 grs.; one hundred cartridges, 4,300 grs.; and the bayonet and sheath, 900 grs. Spare underlinen, socks, greatcoat, and boots, with camp or service tools and bread, may be counted for 17 kilos, to give an aggregate of 23 kilos 300 grammes. If the odds and ends, not included in the regulation kit, which every soldier possesses, the lump burden may be calculated at the average of 25 kilos, or 55 lb. 3 oz. English.—*Broad Arrow.*

New Relations between Light and Electricity.

On repeating the well known experiments in the perforation of insulating plates by the electric spark, with plates of various minerals, Prof. Marangoni has obtained certain curious results. Particularly, with plates of Iceland spar, obtained through a cleavage parallel with the rhombohedron, the following results are obtained: (1) the hole made in Iceland spar by the electric discharge is in a straight line, while in glass it is zigzag; (2) the discharge, instead of following the direction of the planes of cleavage, as might be expected, follows that of the principal axis of the rhombohedron, that is to say, the optical axis; (3) along the aperture there are observed two slits situated in two planes at right angles with each other, and which are intersected by the hole itself, say the optical axis. One of these slits is found in the principal section.

The following arrangement was employed by Prof. Marangoni for performing these experiments:

A funnel was first partly filled with mercury, and upon this was placed a layer of petroleum, and between the two was floated the plate of mineral to be studied. In contact with the mercury there was a copper wire, which was connected with the positive pole of the induced wire of a large Ruhmkorff coil, whose negative pole communicated with the mercury through a copper electrode.

With petroleum, the explosive distance, which was 15 cm. in the air, was reduced to about a seventeenth of its value.

It will be remarked that, through this arrangement, the mercury is in contact with the entire surface of the crystal, and that the discharge is free to follow the line of the least resistance through the crystal. As a general thing, the first spark pierces the plate. Prof. Marangoni experimented in this way with various minerals, such as fluorspar, selenite, muscovite, and topaz; but, as the specimens were defective, the results were of no account. A beautiful specimen of rock salt, on the contrary, gave excellent results. With plates parallel with the plane of the cube and varying from 5 to 10 mm. the electric discharge perforated them at right angles with their faces, and produced two slits at right angles with each other, and consequently with the faces of the cube, and several other small slits at right angles with each other and bisecting the angles of the first. The smallest slits were therefore in planes parallel with the faces of the dodecahedron.

Upon studying plates of rock salt with the Nuremberg polariscope, and upon producing variations in density in them by means of Brewster's press, Prof. Marangoni ascertained the mechanical effect of the discharge. The result of this study is that the density diminishes in the plane of the slits, and increases, on the contrary, in the direction of the bisectrices of their planes. With Iceland spar, the professor observed none of these phenomena.

The facts just made known have led the professor to conclude on the following relations between the propagation of electricity and that of light.

1. Light and electricity, in a medium of regular molecular structure, are propagated in a straight line.

2. Light and electricity, in a minimum of time, that is to say, with the least resistance, take certain directions which are those of the axes of elasticity, or certain directions having determinate ratios to such axes.

3. Light is a transverse vibratory motion, and, in non-isotropic bodies, is decomposed into two rays, so that the plane of the vibrations of one of the rays is at right angles with the plane of the vibrations of the other.

The electric discharge produces slits at right angles with its own direction, and these slits are not, as a general thing, produced according to the planes of cleavage. This would countenance the supposition that electricity also admits of transverse vibrations like light, and might likewise be polarized according to two planes at right angles.

Light, in an amorphous medium, such as glass, changes direction at the least accident, and the trajectory of the luminous vibrations is then very complicated.

So, too, the slit produced by the electric discharge through a plate of glass does not allow of any normal direction.

The facts observed on the electric discharge through crystals are in perfect accordance with Fresnel's theory that the vibrations of ether take place more easily in directions parallel with the layers of the molecules, and that, consequently, every oblique vibration upon one of the axes of elasticity is decomposed into two vibrations, one of which is parallel with such axis and the other at right angles with it.

Prof. Marangoni regards this analogy of effects as a new proof of the hypothesis that attributes light as well as electricity to a vibratory state of ether.—*La Lumiere Electrique.*

Lightning Statistics.

From a recent report by Dr. Hellmann on statistics of lightning damage in Schleswig-Holstein, Baden, and Hesse, it appears that the danger from lightning in these parts (unlike the case of other parts of Germany) has been decreasing of late years. Soft-roofed houses are fired about 7 times oftener than those with hard roofs. Windmills are struck 52 times, and church and clock towers 39 times, oftener than ordinary houses with hard roofs. The marshy regions in Schleswig-Holstein are the most dangerous, and the land about inlets of the east coast the safest. With like conditions, the relative danger decreases the more houses are grouped together. In Baden the danger varies more than in any part of Germany (about Heidelberg it is 24, and in Waldshut 265 per million houses). In Hesse, the low plain of the middle Rhine is the most dangerous part. In the fifteen years 1869–83, there were killed by lightning for every million men, in Prussia, 4·4; in Baden, 3·8; in France, 3·1; and in Sweden, 3·0. The geological nature of the ground, and especially its capacity for water, has important influence. Thus, calling the danger on lime 1, that for sand is 9, while for loam it is 22. This is partly why most of South Germany and Austria is less dangerous than North Germany. There are four factors affecting the lightning danger to buildings: two physical—unequal frequency of storms and geological character; and two social—variable population and mode of building. Of all trees, oaks are most frequently damaged, beeches most rarely (in the ratio 54 to 1).—*Nature.*

The Science of the Base-Ball Curve.

When a ball (or in fact any missile) is advancing rapidly through the air, there is formed in front of it a small aggregation of compressed air. (In passing, we may remark that the compressed air in front of an advancing cannon ball has been rendered discernible—we can hardly say visible—by instantaneous photography.) In shape the cushion of air is conical—or rather conoidal—if the ball is advancing without spin; and therefore it resists the progress of the ball equally on all sides, and only affects the ball's velocity. The same is true if the ball is spinning on an axis lying along its course. But in the case we have to consider, where the ball is spinning on an axis square to its course, the cushion of compressed air formed by the advancing ball has no longer this symmetrical shape. On the advancing side of the spinning surface the air cannot escape so readily as it would if there were no spin; on the other side it escapes more readily than it would but for the spin. Hence the cushion of air is thrown toward that side of the ball where the spin is forward, and removed from the other side. The same thing then must happen as where a ball encounters a cushion aslant. A ball driven squarely against a very soft cushion plunges straight into it, turning neither to the right nor the left, or if deflected at all (as against a billiard cushion), comes straight back on its course; but if driven aslant against the cushion, it is deflected from the region of resistance. So with the base ball. As the cushion of air against which it is advancing is not opposed squarely to it, but is stronger on one side than on the other, the ball is deflected from the region of greatest resistance.—*Prof. R. A. Proctor, in Longman's Magazine.*

AN Illinois correspondent suggests the need of an invention for raking and baling hay as cut in the swath.

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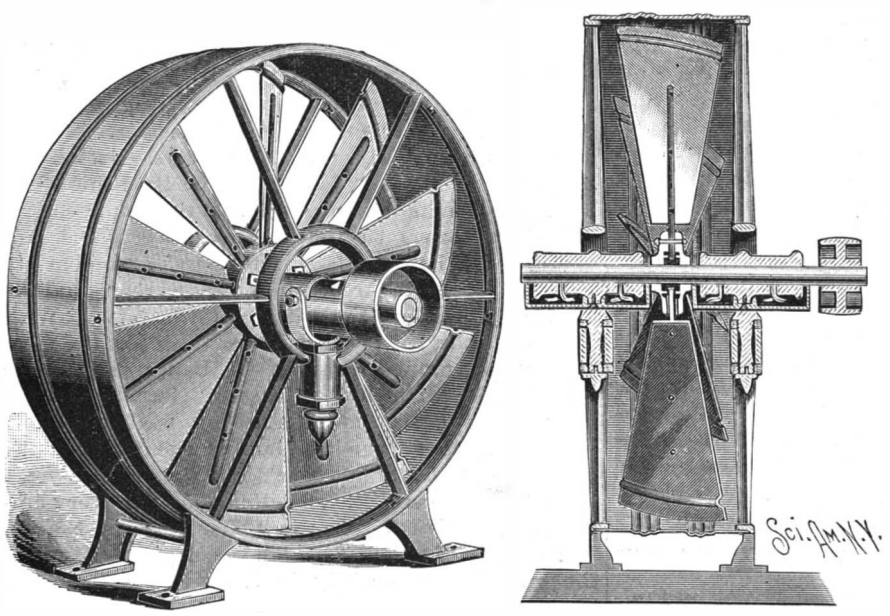
AN IMPROVED VENTILATING FAN.

The illustrations herewith show a ventilating fan, and means for adjusting the hub thereof, by which the blades can be readily fixed at any desired angle of inclination, by simply loosening three nuts on bolts passing through the hub, thus increasing or diminishing the capacity of fan and power required. The hub is divided in two vertical sections, with opposing integral rings having a series of recesses, and a series of triangular projections with angular spaces between them, an annular recess separating the ring and projection of each section. When the two sections are united upon an axle, the flat surfaces of the triangular projections and the ring come in contact, forming a close joint, and a series of irregular openings in the edge, formed by the registering angular spaces. When the hub is slid upon the shaft, the fan rods are entered in the irregular openings, a groove in the rod being made to engage a concavity in the ring. The fans may then be given any desired inclination by turning the rods more or less to the right or left, when they will be held by the engagement of the lower portion of the rods with the ring, the two sections of the hub, when the rods have been placed in position, being held in positive yet detachable connection by a series of bolts.

These fans are so made as to be convenient for pipe connection, and a change of air current is readily effected by simply loosening the three nuts on bolts passing through the hub, and changing the inclination of the fan blades. The style of fan herewith shown can be placed either horizontally or vertically, the "feet" being such as can be attached overhead, on the side of buildings or partitions, or upon the floor.

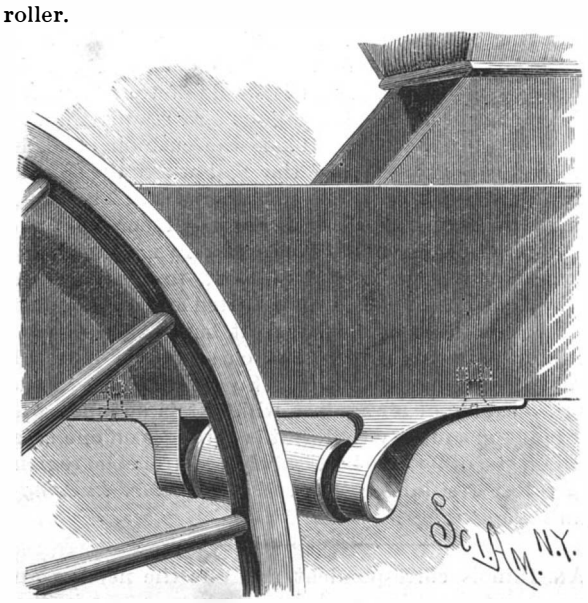


CLARK'S ADJUSTABLE HUB VENTILATING FAN.

For further particulars touching this invention, address the patentee and manufacturer, Mr. George P. Clark, of Windsor Locks, Conn.

AN IMPROVED WEAR PLATE FOR VEHICLES.

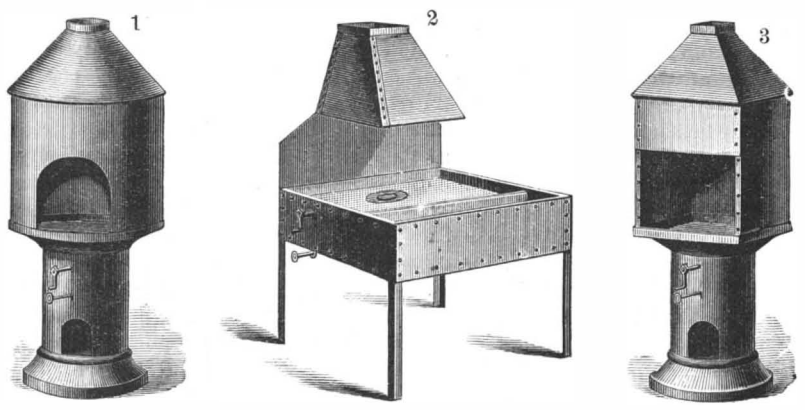
The wear plate herewith illustrated provides a simple means to prevent the forward wheels of a vehicle from marring its body in turning sharply, the device also assisting the wheels in making the turn. The invention is the subject of a patent recently granted to Mr. Burton W. Beach, of Cornwall, N. Y. The construction of the device will be readily understood from the illustration, the wear plate being made with integral ears for ready attachment beneath the vehicle body, and a roller being journaled and held to turn therein flush with its angular edge. The surface of the roller is preferably covered with rubber or a similar elastic material, in order that a hard surface may not be presented to the tire, and to prevent any unpleasant sound from the contact of the vehicle wheel and the roller.



BEACH'S WEAR PLATE FOR VEHICLES.

IMPROVED PORTABLE FORGES.

In the accompanying illustration, Fig. 1 represents an old style forge for horseshoers, but having an improved tuyere iron; Fig. 2 shows a forge for general blacksmithing, and Fig. 3 is a modification of the old style forge, with square top, giving more hearth room and better access to the work, the latter also embodying the details of a recently patented invention. It has a square hearth, with a central depression having an aperture, beneath which is fitted a tuyere iron, having a triangular damper, the latter being controlled by the small crank arm shown just beneath the front opening of the forge, by which the blast may be instantly varied from light to heavy, the blast being communicated through a draught pipe which projects outward through the base. Below this crank is a handle, which operates a slide at the bottom of the tuyere iron, the slide being adapted to dump any dead coal or ashes that may be delivered from the fire by the triangular damper. The corners of this damper are made round to facilitate turning, and by its peculiar shape the fire is readily kept clean.



EHRGOTT'S IMPROVEMENTS IN PORTABLE FORGES.

For further information about these forges address the patentee and manufacturer, Mr. Michael Ehrgott, Nos. 234 to 242 Greene Street, Greenpoint, Brooklyn, E. D., N. Y.

Regulation of Liquor Traffic.

Journals conducted in the interests of the rum sellers deny the right of any one to interfere with a man who wishes to buy and to drink any beverage that he d e s i r e s. This sounds like a defense of personal liberty, but it is mere nonsense.

1. No man has any right to carry on a business which produces results for which other men must pay heavily. The taxes of every citizen are more than doubled by the evils which flow directly from the rum traffic. The rum sellers wax fat, and the mass of taxpayers pay millions of dollars every year that they may have the privilege of doing so.

2. No man has any right to carry on a business which corrupts the morals of other men. Nine-tenths of the crime in this country springs directly from the rum traffic. It corrupts the young, debauches the old, destroys families, cripples workmen, makes politics vicious, defies the Sunday laws, wastes the people's substance, injures trade, and produces pauperism, theft, murder, and insanity. If society has no right to meddle with such a monstrous public nuisance as this, then it has not the ordinary right of self-preservation. —*Textile Record.*

Consumption of Liquors.

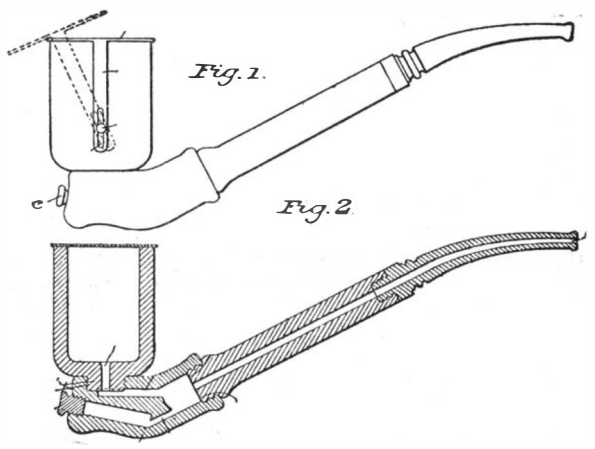
The report of the U. S. Bureau of Statistics gives strong refuting testimony to the assertion that the use of wine promotes temperance by reducing the consumption of stronger liquors. France is pre-eminently the wine-drinking country among the great powers. Of the four whose statistics are given in this report, she alone is becoming more and more addicted to intoxicants. Since 1880 she has far more than doubled her consumption, not only of wine, but of stronger liquors, and is also becoming a large consumer of beer. Her per capita for consumption of ardent spirits was 1·32 gallons; Germany's, 1·14 gallons; Great Britain and Ireland's, 1·01; and America's, 1·24. The same year France consumed 38·88 gallons of wine per capita, against less than half a gallon per capita for the other nations.—*U. Signal.*

Second Hand Corks.

These corks, says a correspondent of the *Analyst*, after lying for weeks around in bar rooms, covered with bad smelling and fermenting vegetations, are sold to dealers who subject them to a kind of bleaching process, run them through a smoothing machine, and sell them to bottlers, weiss beer brewers and others, for use again. A cork may be never so well cleaned, but the internal fissures in it always retain some of the vegetations referred to, and communicate its ravaging properties to the liquids they are used to preserve. Such uses should be prohibited.

AN IMPROVED PIPE FOR TOBACCO SMOKERS.

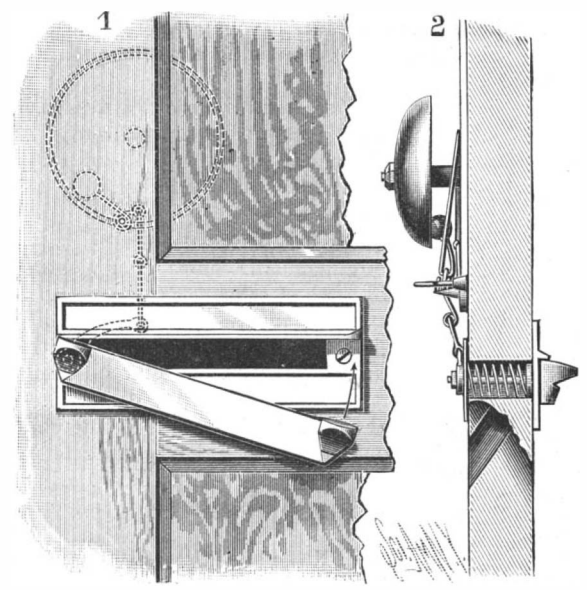
The construction of the pipe herewith illustrated will be readily understood from the two views given. It has been patented by Mr. Fred Roesling, of 394 North Perry Street, Cleveland, Ohio. It is designed so that the moisture chamber may be cleansed without removing the stem, and to prevent the moisture from re-entering the bowl or passing up the stem to the smoker's mouth, while the bowl, chamber, stem, and mouthpiece may be separately cleansed when desired. The cover of the bowl has downwardly extending slotted arms, which engage pins fixed to opposite sides of the pipe, whereby the cover may be readily removed and replaced.



ROESLING'S TOBACCO PIPE.

AN IMPROVED DOOR PLATE AND BELL PULL.

The illustration herewith represents a simple form of combined door plate, bell pull, and mail receiver which has been patented by Mr. Michael A. McGlinn, of No. 122 Charlotte Street, Lancaster, Pa. The plate, which is designed to receive a name or number, is adapted to cover the mail-receiving aperture in the door, and at the same time to be used as a means for operating the door bell. This plate has at one end a stud which extends through the door, so that pressing down the plate at the other end of this stud will operate a door bell, the picture showing an ordinary double stroke bell, such as are in common use. Around this stud is a spiral spring that is under continual strain, and tends to keep the cover or name plate over the aperture, and in contact with a ledge over it, which is provided to prevent the entrance of rain or dust. The cover plate, when pushed down, is brought back to place again, when released, by the spring, and thus rings the bell.



McGLINN'S DOOR PLATE, BELL PULL, AND MAIL RECEIVER.

THE first iron boat is thought to have been built in 1777, on the river Foss, in Yorkshire. It was fifteen feet long, and made of sheet iron.

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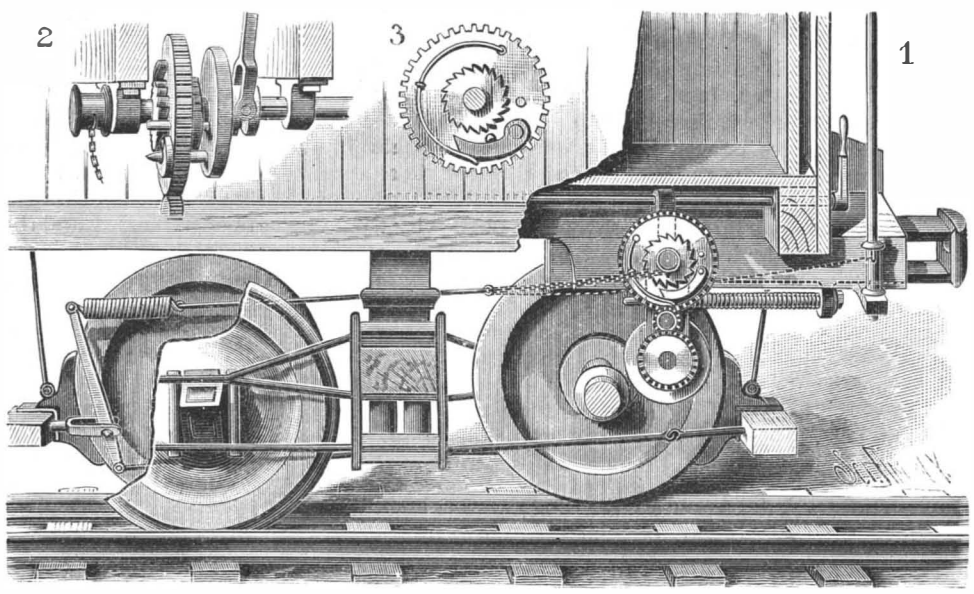
AN IMPROVED AUTOMATIC CAR BRAKE.

A novel construction of car brake, intended specially for use on freight cars, is shown in the accompanying illustration, and has been patented by Mr. Orson P. Smith, of Buford, Macoupin County, Ill. Attached to the under side of the drawbar is a rod on which is a coiled spring pressing at its rear end against a frame pivotally suspended from the bottom of the car. In the lower end of this frame is journaled a shaft carrying a friction pulley adapted to engage a friction pinion on one of the car axles. On this shaft is also a



SMITH'S AUTOMATIC CAR BRAKE.

gear wheel, which communicates its motion, through a small pinion, to a larger gear wheel above, the latter being fixed on a shaft that is axial with the fulcrum of the suspended frame, so that a swinging motion of the latter does not disconnect the gears. On this upper shaft is also a pulley, on which winds one end of the brake chain, which is made fast at its other end to the brake rod, operating the usual brake mechanism in the ordinary way.

This brake-operating mechanism is only on one end of the car, and when the latter is moving forward with a pull upon the drawhead, the friction pulley in the suspended frame does not act upon the car axle. When the engineer desires to brake the car automatically, he lessens the speed of the locomotive, and the drawheads, coming together, are pushed inward, whereby the spring upon the rod attached to the under side of the drawbar presses the suspended frame inward, and the friction wheel which it carries is brought into frictional contact with the pinion on the car axle, the shaft in the suspended frame thus operating the one above it, on a pulley upon which the brake chain is wound and the brake shoes thereby applied.

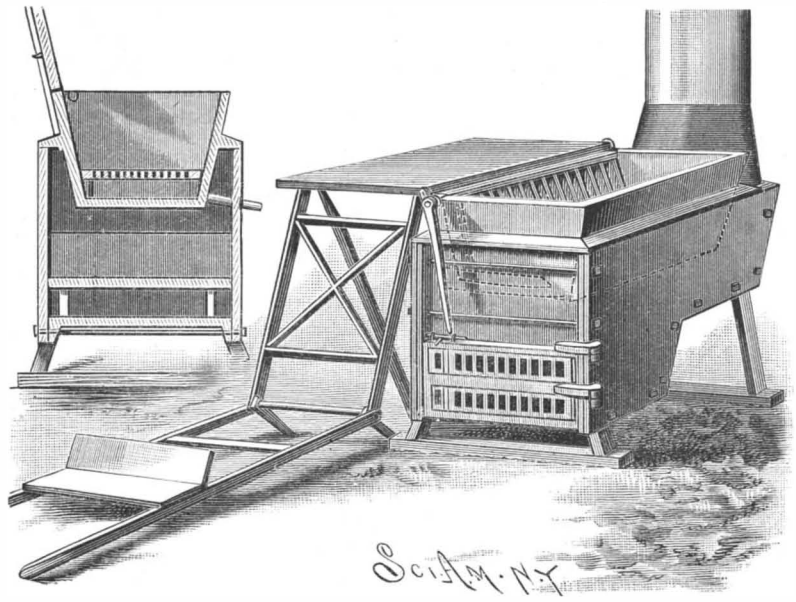
Upon each face of the larger gear wheel of the upper shaft, as shown more clearly in Figs. 2 and 3, is secured a ratchet wheel, the teeth of which stand in opposite directions on the two faces, and a spring-controlled pawl engaging the ratchet wheel on either side. The reversing mechanism, consisting of a disk adapted to slide sidewise on the same shaft, operates these pawls, the disk having projecting pins which pass through apertures in the web of the large gear wheel, and each having a bevel which operates on the pawls, in such a manner that while one pawl is held in contact with its ratchet wheel the other is disengaged from the other ratchet wheel. The disk can be moved sidewise by a shifting device, consisting of an arm with a lever handle extending upward at the ends of the car, the arm being secured to a shaft held in suitable bearings on the under side of the car, and extending its entire length. When the car is coupled at its other end to the preceding car, the train of gearing connected with the friction wheel upon the axle winds the brake chain upon its pulley in the reverse direction, the lever handle extending up from opposite ends of the car being moved so as to bring the pawl and ratchet wheel on the opposite face of the large gear wheel into engagement. When the train is backed up, the friction wheels rotate the train of gear wheels, but the respective pawls do not engage the ratchet wheels, and the shaft on which is the brake chain pulley is not rotated by the large gear wheel and its connections. The brake rod is also connected in the usual manner with the hand brake of any ordinary form of construction, as shown in our illustration.

The Malabar.

The Indian troop ship Malabar has made a six hours' full power trial at Portsmouth of the new set of engines with which she has been fitted by Earle's Shipbuilding Company, at Hull. The engines are of the triple expansion kind, and are the largest of the type which have been received in her Majesty's service, and, with one or two exceptions, the largest which have been yet manufactured in this country. In addition to the new engines, the hull has been subjected to a complete overhaul and repaired outside and inside, new fresh water condensers and fire engines of superior size and power being also supplied. The maximum power indicated at the trial was 4,505 horse, but the mean of the entire trial was 4,231, being below the contract. The speed realized was particularly good, reaching close upon 15½ knots, while the consumption of fuel per horse power per hour was as low as 1·67 lb.

A COMBINED FEED COOKER AND SCALDER.

The invention herewith illustrated, which forms the subject of a patent recently issued to Mr. William A. Steffa, of Rockvale, Oregon P. O., Ill., furnishes a novel construction of feed cooker and hog scalder, which can be readily used for either purpose. The furnace portion is commodious, and calculated to burn advantageously almost any kind of fuel, the furnace door having dampers both above and below the grate, the latter being readily removable if desired. Within the furnace is suspended a tank with flaring sides and ends, so that spaces will be left between the sides and ends of the tank and those of the furnace, and the products of combustion will pass all around the tank. The cover of the tank is hinged to lugs, in such way that it can be turned back and supported in horizontal position at one side to serve as a table; and connected with the forward end of the cover is a hinged frame, which carries a shelf or chair, of sufficient size to receive a hog, so that when the frame is raised the hog will slide or can be readily drawn upon the open cover of the tank at its side. Close to the hinged edges of the cover, and within the tank, is journaled a shaft upon which are formed arms, that rest against the side and bottom of the tank when turned down, but which serve as a cradle for lowering the hog into and raising it from the tank, this cradle being operated by a crank arm or lever at the front. When feed is to be steamed, a perforated false bottom, as shown in the small view, is placed in the lower part of the tank, and the liquid or semi-fluid contents of the tank may be drawn off through a discharge opening in the lower part of one side.



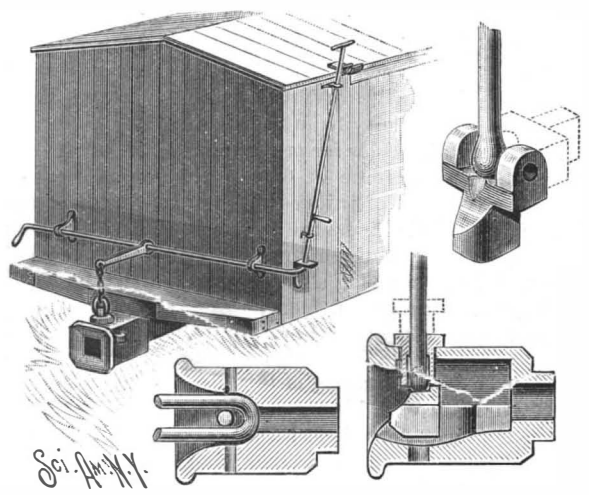
STEFFA'S FEED COOKER AND SCALDER.

Puddled Aluminum Iron.

Recently we had occasion to refer to some successful experiments in the manufacture of cast steel, free from blow holes. The results were due to the admixture to the steel of 0·1 per cent of aluminum. During the week just closed, experiments were made with puddled iron in charges of 500 lb. The results were by no means conclusive, but enough was shown to illustrate the advantages of combining aluminum with iron. Strangely enough, the charges containing the low percentages of alloy turned out the strongest material. So, for instance, the addition of 0·1 per cent of aluminum raised the tensile strength from 52,000 lb. to 60,000 lb., an increase of 16 per cent, while the elongation was variously increased up to 21 per cent. One of the tests conformed to the method of testing marine steel, the elongation of the one inch test spot being 0·1875 per cent, or 3-16 of an inch. What may be done with puddled iron is shown by experiments conducted by Mr. Graham W. Thompson, a leading iron manufacturer of Glasgow. The tensile strength of ordinary puddled iron, 22 long tons with 12 per cent elongation, was by the addition of 0·25 per cent of aluminum increased to 31 long tons with 23 per cent elongation. When mixed in equal parts with ordinary stock, this treated material still showed a tensile strength of 28 English tons, with 8·28 per cent elongation, and a third mixture of the already reduced stock with common stock resulted in a tensile strength of 25 tons, with 7 per cent elongation. The experiments with puddled iron will be pursued in other ways until some fixed rule of procedure may be established.—*Cleveland Iron Trade Review.*

AN IMPROVED CAR COUPLING.

The accompanying illustration represents the principal features of a car coupling which has been patented by Mr. Bush F. Laird, of Ocean Springs, Miss. One of the small figures gives a longitudinal sectional view, and another is a plan in section of the bottom of the drawhead with the coupler entered, while a third figure shows the action of the pin support, the dotted lines indicating its backward swing as the entering coupler pushes against its front side. This pin support is held in its pivoted position by bolts entering



LAIRD'S CAR COUPLING.

from either side of the drawhead, and the pin is movable vertically in a sleeve with a shoulder which engages a top plate. The horizontal shaft across the car just above the drawhead, with its arm and chain, and its connections at each side and at the top of the car, indicate the means of coupling and uncoupling to obviate the necessity of the operator going between the cars.

Colors from Coal Tar.

Prof. Watson Smith, of Owens College, Manchester, England, in speaking of colors obtained from coal tar, recently said:

"Formerly they used to rely principally upon vegetable dyes of animal origin. The vegetable or wood dyes, however, had to a large extent disappeared, and there were not many of these with which they needed to trouble their minds, because they had been replaced, and would be still further replaced, by other materials. There were really only two of these vegetable dyes remaining—indigo and logwood—all other wood dyes having been already more or less replaced by coal tar dyes. Lac dye had been entirely displaced, and the consumption of cochineal had been reduced to probably less than 200 tons per year. A great deal has been said against coal tar dyes. They were told that these dyes were fugitive and poisonous, and that there could not be produced from them as fine a shade as was obtained from the vegetable dyes. Now, all this was fallacious. If all that had been said against coal tar colors was true, one would naturally be led to suppose that the consumption of them would decrease. But what was the fact? Why, in the last year the consumption of these coal tar colors had increased more than thirty-three per cent. Trade last year was bad all over the world—they hoped that this year it might be better—yet this increase of consumption had taken place, quite exclusively, he should say, in compound colors. No fabrics were now dyed in any of the pure colors, and the increase of consumption had taken place in judiciously blending these colors with themselves or with vegetable dyes. A card of 'spring shades, 1887,' being 150 different colors obtained from coal tar, without indigo or any vegetable dyes, was shown. These colors comprise many bright and most delicate shades."—*Progressive Age.*

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THE NEW HEADQUARTERS OF THE FIRE DEPARTMENT OF THE CITY OF NEW YORK.

[*See first page.*]

The fire department of the city of New York has recently taken possession of its new headquarters, 157 and 159 East Sixty-seventh Street, some illustrations of which are given. A few words as to the organization of the corps will be appropriate. Under the control of its able president, Mr. Henry D. Purroy, it has reached such a degree of efficiency that few fire departments of the world will bear comparison with it.

By law four bureaus are established. The first of these is entitled the Bureau of Chief of Department. This includes the uniformed force, devoted to the extinguishing of fires. It contains 972 men actively engaged in attendance on fires, the city's "firemen," and 35 men who are relieved from attendance at fires, but are employed in other services. This naturally is the most prominent and most important division. The next of the bureaus is entitled the Bureau of Inspectors of Combustibles. Ten names compose the roll of this division. Their work relates to the prevention of fires by supervising the storage of oil, of fireworks, and of other combustible goods. Next comes the Bureau of the Fire Marshal, employing four officials. The duties of this bureau relate to the determination of the causes of fires and the detection of incendiarism. Many of the indictments for the crime of arson are brought before the grand jury on information furnished by the fire marshal. The fourth bureau is the Bureau of Inspection of Buildings The erection and alteration of buildings are in its charge, in order that the operations may be carried out in accordance with law. The force of this bureau numbers 63.

The telegraph service is in the hands of a force numbering 18 men and officers. On this department the efficiency of the fire-extinguishing bureau in great part depends. As will be seen later, the attendance of the engines at fires depends entirely upon the proper working of the electrical apparatus, even the horses being released by electricity from their stalls.

The hospital stables for treatment of sick horses employ a temporary force of 6 men, the repair shops 65, and for treatment of injured firemen one medical and two vice-medical officers are retained. Three fire commissioners compose the governing board. In the headquarters building the secretary and assistants, with clerks, etc., aggregate fifteen.

The fire engines and other apparatus are distributed through the city in a number of engine houses. The number of fire companies is fifty-five. There are also nineteen hook and ladder trucks and two fire boats. Of the engine companies, nine are called "double companies," possessing a double complement of men and apparatus, so that when the first set goes to a fire the next move up and take their places, ready for a second alarm. It was for companies of this class that Commissioner Purroy proposed the double engine house already described by us.* Two of the hook and ladder truck companies are also double. Three water towers complete the census of apparatus. Each engine, it should be noted, has its own tender or hose cart. Two scaling ladders are attached to each tender.

No branch of governmental service is more dependent for its efficiency upon the personal character of its members than is the fire service. Not only are fires to be extinguished, but lives are to be saved and deeds of absolute heroism are every year enacted. The work depends not only on disciplined forces, but on the individual as well. Hence great care is exercised in choosing the members. The following is the system in use in making the selection. The application for a position is made in writing, and the paper is sent to the chief of battalion in whose district the man resides. The chief makes inquiries as to the man's personal qualities of the police of his district. If this report is satisfactory, the applicant has to submit to a physical examination to decide as to his bodily soundness and height and weight. Five feet seven inches and 140 pounds are the minimum. In measuring the height, a curious arrangement is used to avoid imposition. Under each heel as the man stands on the platform of the measuring apparatus is a little trap door, pressed upward by a spring. When pressed down to their seat, an electric contact is made and a bell rings. The subject of measurement, therefore, has to press these down and keep the bell ringing. This prevents him from raising his heels from the ground, and so apparently increasing his height.

This examination having been passed, he is referred to the civil service commissioner, who examines him, not only mentally, but physically. He is taken to a gymnasium, where he has to "walk the ladder," and do various other gymnastic exercises to test his corporeal qualities. In the headquarters a very fine gymnasium is included, and it is designed to use it in these examinations. Hitherto a private gymnasium has been engaged. If the civil service examinations are successfully passed, the applicant is put upon probation for thirty days. Part of the time is spent in the life-saving school, where he is taught the use of the scaling ladders, life lines, etc. Part of the time is spent with an engine company, where he attends fires and sees the actual work. All the officers with whom he comes in contact report upon his character and qualities. If the report is favorable, he undergoes a new physical examination, as latent defects may have been developed in his thirty days of probational service. If this examination is successfully passed, he receives his appointment to the third grade, and for the first time puts on his uniform.

The above examination and probation is certain to develop any weakness or incapacity in the applicant. It may be taken as a model in its way, for its thoroughness and practical character.

The use of the scaling ladder, which is an important subject in the training school, is illustrated. It consists of a pole with a long hook at its top, with serrated edges. Through the pole short pieces of wood are thrust and secured, forming steps. At a fire the front of a building can be scaled in a few minutes by these simple appliances. The fireman hooks one into the first story window. He climbs it rapidly, carrying another one with him. When near the top of the first ladder, he hooks himself to it by a large hook attached to his belt, and thus steadied he can lean back, pass up the other ladder, and hook it into the window of the story above. He unhooks himself, climbs the second ladder, carrying the first one with him, and by repeating these movements can go as high on the building as he wishes. By having others follow him, a complete string of ladders may be raised. He can travel laterally from one window to another by the same ladders, and thus swing across the face of a building. Up these ladders life lines are carried, and persons can be brought down these to the ground. A fireman, by twisting the ropes in the hook on his belt, acquires a sufficient purchase or brake power to be able to carry several men down the line safely. These form the main life-saving appliances. In addition thereto, guns are used for shooting lines up to the tops of buildings, battering rams for breaking in doors, and many other minor apparatus are provided. The life-saving school deals with these methods. Formerly there was a special life-saving corps. Now every fireman is taught the system before he is appointed.

The order of rank in the service is as follows, beginning with the lowest: Fireman of third, second, and first grades, engineer of steamer, assistant foreman, foreman, chief of battalions, twelve in number, second and first assistant chief, each in charge of six battalions, and chief. The salaries range from $1,000 to $5,000. Of these officials, the engineers of steamers require a special knowledge. A man may be promoted without ever filling this post. The tendency, however, among the men is to qualify for it, and keep in the line of promotion to it.

The electrical service, whose central office is in the new building, we have illustrated in some detail. Under the management of Mr. J. Elliot Smith, the superintendent of telegraphs, it is kept in a state of the highest efficiency, and the system, now in the highest state of perfection, is largely due to him. In general terms, the city is covered with three separate systems of circuits, all starting from the central office. The first of these systems is the alarm circuits. All of these radiate from the building, each including from fifteen to twenty-five of the telegraph pole and lamp-post alarm boxes. Each circuit has its individual number and each alarm box also has its serial number, irrespective of its circuit. When a fire occurs, and the handle in the alarm box has been pulled down by the person opening it, the apparatus within it automatically rings out its signal number five times in succession. This is received at the central office. Its effect there is twofold. It drops a shutter disclosing the circuit number, and it actuates the receiving register. On the broad strip of paper passing through this instrument, the alarm box number is printed off five times. The switch board seen on the left of the fire telegraph room is used for the next manipulations. At its top are a row of the drop shutters, whose fall discloses to the operator the circuit number. So far all the work has been done upon one set of circuits. The other sets, the second and third ones, are parallel, and go to all the engine houses. Each set includes eight circuits, and these cover the whole city. The second set actuates a six inch gong and a detaching apparatus that releases the horses. They are worked by eight relays, situated on the same side of the office in the rear. The third set rings the large gong in the engine houses, and are quite independent of the second set.

As soon as the signal sounds, the operator runs to the switch board and counts the signal. If it comes properly, he pulls down one of the switch handles that is situated at the bottom of the switch board, selecting the one that comes under the open drop shutter. This throws the eight relays of the second system, called the "combination circuits," into the alarm box circuit, and as the fire signals keep coming, they are automatically rung all over the city in every engine house. This releases all the horses, and wakes all the men. The horses take their places, are harnessed, and in a few seconds every engine, tender, hook and ladder truck, and water tower in the city is ready for service.

It may happen that the five signals from the alarm box run out before the operator can note the adjustment and depress the switch. If so, he notes the signal, referring to the receiving register if necessary, and sends it out by a Morse key. As soon as he disposes of the alarm thus, he goes to the button transmitter. In it he inserts a notched button corresponding to the alarm, and starts the transmitter. This repeats the signal upon the gong circuits.

The signals are noted in all the engine houses. To each signal ten engines and trucks or upward are assigned. Of these, when the complement is complete, three engines and two trucks are assigned to the first alarm, four engines to the second, and four engines to the third. The engines and trucks assigned to the given signal remain in the houses with horses harnessed, except those assigned to the first alarm, which at once proceed to the scene of the fire. All through the rest of the city the horses are unharnessed and the men retire. If the officer in command at the fire finds it too large for the force present, he opens, by the department key, which all officers carry, the inner compartment of the alarm box and sends the "second alarm," prefacing the box number by ten strokes. This is received at the central station, and by the combination transmitting repeater is sent to every engine and truck house in the city. Again all is astir and the entire force of the city is again ready, while the four engines and two trucks assigned to the second call of that number go to the fire. In the same way the "third call" and urgency calls for more companies are sent to the central office, and sent out from it on the large gong circuits by the combination transmitting repeater.

This instrument has on its face four disks. Each of them can be set to ring any desired number, and when the machine is started it rings the four numbers, if so many are set, in succession. Thus an immense number of combinations are provided for by it.

On the right of the telegraph room are a series of switches and galvanometers, for testing the different lines.

The new building, situated in 67th Street, between Third and Lexington Avenues, contains the general offices of the bureaus and of the commissioners. It is fifty feet wide, with a yard back of it reaching to 68th Street. It is built of brown stone and brick, and is finished inside with oak. It is fireproof. A hydraulic elevator and electric lights are provided, the latter actuated by a Brush dynamo. An engine company and hook and ladder truck company are accommodated also on its lower floors. The life-saving school practice the use of the scaling ladders upon its rear windows. Its tower, in iron, is one of its most beautiful features. It is notable as being the only municipal building in the city constructed within the estimates. The building was designed by N. Le Brun & Son, architects to the department.

* See SCIENTIFIC AMERICAN, vol. lv., page 170.

Amidogen.

A brilliant discovery is announced in the current number of the *Berichte der Deut. Chem. Ges.* by Dr. Theodor Curtius, who has succeeded in preparing the long sort for hydride of nitrogen, $(NH_2)_2$, amidogen, diamide, or hydrazine, as it is variously termed. This remarkable body, which has hitherto baffled all attempts at isolation, is now shown to be a gas, perfectly stable up to a very high temperature, of a peculiar odor, differing from that of ammonia, exceedingly soluble in water, and of basic properties. In the course of his work upon the diazo compounds of the fatty series, Dr. Curtius treated diazo acetic ether with hot, strong potash, and obtained the potassium salt of a new diazo fatty acid, which, on addition of mineral acids, yielded yellow tabular crystals of the free diazo acid. On digesting the yellow aqueous solution of this acid with very dilute sulphuric acid, the color disappeared without the usual evolution of nitrogen; and on cooling a magnificently crystalline substance separated out, which was shown by analysis to be no other than the sulphate of amidogen, $(NH_2)_2 . H_2SO_4$. These crystals remained unchanged at 250°, but on strongly heating over a flame melted with explosive evolution of gas and deposition of sulphur. On warming this salt with potash solution the free diamide, $(NH_2)_2$, was expelled as a gas which changed red litmus into blue, and rendered itself evident by its irritating odor. The gas fumed in contact with hydrochloric acid, forming the hydrochloride, and on leading it into sulphuric acid reformed the sulphate. It possessed energetic reducing properties, reducing Fehling's and ammoniacal silver solutions in the cold, gave a dense red precipitate with neutral copper sulphate, and formed crystalline compounds with aromatic aldehydes and ketones. It is very seldom that chemistry is enriched by the discovery of a new gas, and the intrinsic value of the isolation of amidogen to both organic and inorganic chemistry renders the communication of Dr. Curtius one of exceptional and of far more than passing interest.—*Nature.*

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Correspondence.

A Lunar Rainbow.

To the Editor of the Scientific American:

A lunar rainbow is a phenomenon of such rare occurrence that the event seems worthy of notice.

On the evening of July 5, between nine and ten o'clock, a complete and beautiful lunar rainbow was visible to the inhabitants of Petersburg, Ill.

The evening was beautiful. The full moon lighted up a huge cumulus mass of cloud in the northwest, from the nimbus portion of which was falling a summer evening shower. As the rain was falling close up to the edge of the cloud, and as the atmosphere was exceptionally clear, with the moon about three hours high, it will be seen that the circumstances were peculiarly adapted to the formation of a rainbow. The southern extremity of the bow was first visible as a faint streak of light, but sufficiently striking to attract the attention of even a careless observer. Slowly it gained length and brilliance, until the arc was complete, standing out, with the colors easily distinguished, against the dark background of cloud and rain.

Immediately outside the bow the background was very dark, probably on account of the dense structure of the cloud above, while on the inner side it was much lighter. The contrast of these two shades was very marked at the bow.

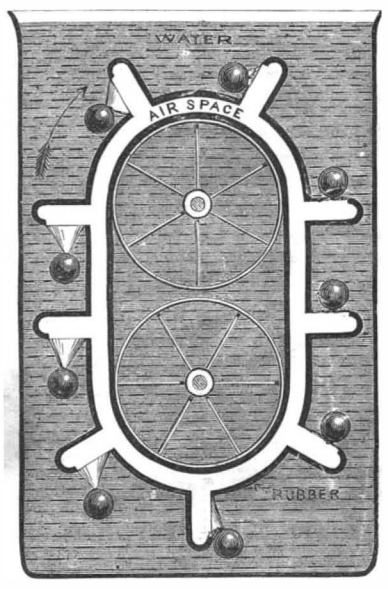
The beautiful rainbow continued thus for, perhaps, fifteen minutes, when, a cloud drifting before the moon from the south, the southern portion was obscured, but the northern continued for some minutes. C. E. E.

Petersburg, Ill., July 11, 1887.

A PERPETUAL MOTION MACHINE.

A correspondent describes the following "perpetual motion machine:"

"It is an endless rubber tube, with projections, on which are fastened thin rubber bags, and a small



weight is attached to each bag. The bags are filled with air when the weight hangs down, and when it comes on top it presses the air out and through the hollow projection and tube into the next bag that comes in position. When placed over two wheels in water, the bags filled with air should be lighter and rise, while the other side with the air forced out should sink."

Each bag, as it comes into position at the bottom of the left tube, will be filled with air expelled from a bag at the top. The weights will descend a certain amount, one in expanding and the other in contracting the bag. The lower bag has to be expanded against a heavy water pressure. Thus each weight will suffer "lost motion," and a constant loss of power in this inoperative falling of the weights, both at the upper and lower portions of their course, will take place. Hence the machine will not move.

Our Slow and Weak New Navy.

Captain Bunce, of the Atlanta, has officially reported the result of firing a couple of rounds from the guns of the new ship on July 15, at Gardiner's Island. He says:

"The result of this firing has been to completely disable both eight-inch B. L. gun carriages and to throw doubt upon the efficiency of the six-inch B. L. gun carriages and the three-pounder rapid-fire gun mounts.

"The arrangement of the battery has proved to be bad, as some of the guns have to be abandoned by their crews that the other guns may be fired at the target."

The report inclosed shows in detail the extent of the damage, which consists mainly in breakage of electric light plant, driving in of panels, disarrangement of joiner work, breakage of cabin windows, and a slight splintering of the deck.

THE ironclad Sinope, 10,000 tons, was launched on June 1 from the Russian Company's dockyard at Sebastopol.

Disinfection and Disinfectants.

Last December the State Board of Health of Connecticut, in its ninth report to the Governor of the State, made the following report on disinfectants, which the committee, after due examination, adopted as the result of a recommendation by the Public Health Association of St. Louis, which was composed of some of the most distinguished hygienic professors and physicians in the country.*

The object of *disinfection* is to prevent the extension of infectious diseases by destroying the specific infectious material which gives rise to them. This is accomplished by the use of *disinfectants.*

There can be no partial disinfection of such material; either its infecting power is destroyed or it is not. In the latter case there is a failure to disinfect. Nor can there be any disinfection in the absence of infectious material.

It has been proved for several kinds of infectious material that its specific infecting power is due to the presence of living micro-organisms, known in a general way as "disease germs;" and practical sanitation is now based upon the belief that the infecting agents in all kinds of infectious material are of this nature. Disinfection, therefore, consists essentially in the destruction of disease germs.

Popularly, the term disinfection is used in a much broader sense. Any chemical agent which destroys or masks bad odors, or which arrests putrefactive decomposition, is spoken of as a disinfectant. And in the absence of any infectious disease, it is common to speak of disinfecting a foul cesspool, or bad smelling stable, or privy vault.

This popular use of the term has led to much misapprehension, and the agents which have been found to destroy bad odors—*deodorizers*—or to arrest putrefactive decomposition—*antiseptics*—have been confidently recommended and extensively used for the destruction of disease germs in the excreta of patients with cholera, typhoid fever, etc.

The injurious consequences which are likely to result from such misapprehension and misuse of the word disinfectant will be appreciated when it is known that: *Recent researches have demonstrated that many of the agents which have been found useful as deodorizers, or as antiseptics, are entirely without value for the destruction of disease germs.*

This is true, for example, as regards the sulphate of iron, or copperas—a salt which has been extensively used with the idea that it is a valuable disinfectant. As a matter of fact, sulphate of iron in saturated solution does not destroy the vitality of disease germs or the infecting power of material containing them. This salt is, nevertheless, a very valuable antiseptic, and its low price makes it one of the most available agents for the arrest of putrefactive decomposition in privy vaults, etc.

Antiseptic agents, however, exercise a restraining influence upon the development of disease germs, and their use during epidemics is to be recommended, when masses of organic material in the vicinity of human habitations cannot be completely destroyed, or removed, or disinfected.

While an antiseptic agent is not necessarily a disinfectant, all disinfectants are antiseptics; for putrefactive decomposition is due to the development of "germs" of the same class as that to which disease germs belong, and the agent which destroy the latter also destroy the bacteria of putrefaction, when brought in contact with them in sufficient quantity, or restrain their development when present in smaller amounts.

A large number of the proprietary "disinfectants," so called, which are in the market, are simply deodorizers or antiseptics, of greater or less value, and are entirely untrustworthy for disinfecting purposes.

Antiseptics are to be used at all times when it is impracticable to remove filth from the vicinity of human habitations, but they are a poor substitute for cleanliness.

During the prevalence of epidemic diseases, such as yellow fever, typhoid fever, and cholera, it is better to use in privy vaults, cesspools, etc., those antiseptics which are also disinfectants—*i. e.*, germicides; and when the contents of such receptacles are known to be infected, this becomes imperative.

Still more important is the destruction at our seaport quarantine stations of infectious material which has its origin outside of the boundaries of the United States, and the destruction, within our boundaries, of infectious material given off from the persons of those attacked with any infectious disease, whether imported or of indigenous origin.

In the sick room we have disease germs at an advantage, for we know where to find them, as well as how to kill them. Having this knowledge, not to apply it would be criminal negligence, for our efforts to restrict the extension of infectious diseases must depend largely upon the proper use of disinfectants in the sick room.

The infectious character of the dejections of patients suffering from cholera and from typhoid fever is well established; and this is true of mild cases and of the earliest stages of these diseases as well as of severe and fatal cases. It is probable that epidemic dysentery, tuberculosis, and perhaps diphtheria, yellow fever, scarlet fever, and typhoid fever, may also be transmitted by means of the alvine discharges of the sick. It is, therefore, of the first importance that these should be disinfected. In cholera, diphtheria, yellow fever, and scarlet fever all vomited material should also be looked upon as infectious. And in tuberculosis, diphtheria, scarlet fever, and infectious pneumonia the sputa of the sick should be disinfected or destroyed by fire. It seems advisable also to treat the urine of patients sick with an infectious disease with one of the disinfecting solutions below recommended.

Chloride of lime, or bleaching powder, is perhaps entitled to the first place of disinfecting excreta, on account of the rapidity of its action. The following standard solution is recommended:

Dissolve chloride of lime of the best quality in pure water, in the proportion of four ounces to the gallon.*

Use one quart of this solution for the disinfection of each discharge in cholera, typhoid fever, etc.† Mix well and leave in vessel for at least one hour before throwing into privy vault or water closet. The same directions apply for the disinfection of vomited matters. Infected sputum should be discharged directly into a cup half full of the solution.

Standard solution No. 2 consists in dissolving corrosive sublimate and permanganate of potash in pure water, in the proportion of two drachms of each salt to the gallon.

This is to be used for the same purposes and in the same way as *standard solution No.* 1. It is equally effective, but it is necessary to leave it for a longer time in contact with the material to be disinfected—at least four hours. The only advantage which this solution has over the chloride of lime solution consists in the fact that it is odorless, while the odor of chlorine in the sick room is considered by some persons objectionable. The cost is a little more.‡ It must be remembered that this solution is highly poisonous. It is proper, also, to call attention to the fact that *it will injure lead pipes if passed through them in considerable quantities.*

It will be best to empty the vessel containing excreta and disinfectant into an earthen jar or wooden vessel, and to leave it for twenty-four hours, at the end of which time it may be thrown into a privy vault, or into a hole in the ground excavated for this special purpose.

Disinfection of the Person.—The surface of the body of a sick person, or of his attendants, when soiled with infectious discharges, should be at once cleansed with a suitable disinfecting agent. For this purpose, solution of chlorinated soda (*liquor sodæ chlorinatæ*) diluted with nine parts of water, or *standard solution No.* 1 diluted with three parts of water, may be used. A two per cent solution of carbolic acid is also suitable for this purpose, and under proper supervision the use of a solution of corrosive sublimate—1 : 1,000—is to be recommended.

In diseases like smallpox and scarlet fever, in which the infectious agent is given off from the entire surface of the body, occasional ablutions with solution of chlorinated soda diluted with twenty parts of water will be more suitable than the stronger solution above recommended.

In all infectious diseases, the body of THE DEAD should be enveloped in a sheet saturated with *standard solution No.* 1, or with a 5 per cent solution of carbolic acid, or a 1 : 500 solution of corrosive sublimate.

(To be continued.)

Alloy-Resisting Acids.

Mr. Rettz has invented an alloy which offers great resistance to the action of acids and alkalies. It has the following composition:

Copper	15 parts.
Tin	2·34
Lead	1·82
Antimony	1

It is said to be a useful substitute, in laboratories, for ebonite and porcelain.

* The following gentlemen composed the committee: Dr. George M. Sternberg, Surgeon U. S. Army, Fellow by Courtesy in the Johns Hopkins University, Baltimore; Dr. Joseph H. Raymond, Professor of Physiology and Sanitary Science in Long Island College Hospital, and Health Commissioner of the city of Brooklyn; Dr. Victor C. Vaughan, Professor of Physiological Chemistry in the University of Michigan, and member of the Michigan State Board of Health; Major Charles Smart, Surgeon U. S. Army, and member of the National Board of Health; Dr. W. H. Watkins, Medical Director of the Auxiliary Sanitary Association of New Orleans; Dr. Albert R. Leeds, Professor of Chemistry in Stevens Institute of Technology, and member of the New Jersey State Board of Health; and Dr. George H. Rohe, Professor of Hygiene in the College of Physicians and Surgeons, Baltimore.

* Good chloride of lime should contain at least 25 per cent of available chlorine. It may be purchased by the quantity at 3½ cents per pound. The cost of the standard solution recommended is, therefore, less than one cent a gallon. A clear solution may be obtained by filtration or by decantation, but the insoluble sediment does no harm, and this is an unnecessary refinement.

† For a very copious discharge use a larger quantity. For the disinfection of solid or semi-solid fæces use a solution of twice this strength—8 ounces to a gallon of water—in the proportion of one quart for every 4 ounces of material to be disinfected.

‡ Corrosive sublimate costs about 70 cents a pound, and permanganate of potash 65 cents a pound, by a single pound. This makes the cost of *standard solution No.* 2 a little more than 2 cents a gallon.

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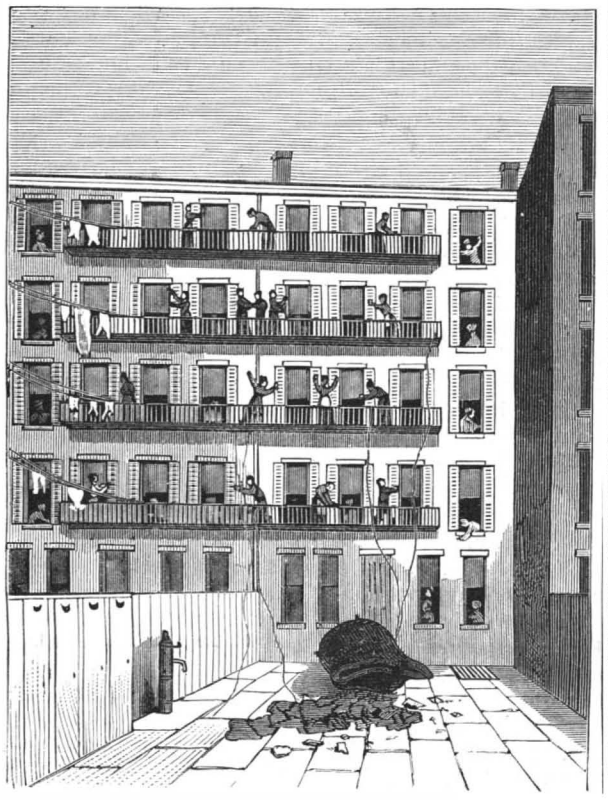
A REMARKABLE BOILER EXPLOSION.

A very remarkable boiler explosion occurred in this city on Saturday, July 16. We illustrate some of the features of the occurrence. The boiler was of the upright tubular type; nine feet high, four feet in diameter, of ⅜ inch iron, and had 129 tubes. Its total weight was about two tons. It was situated in a



END OF THE FLIGHT.

shed in the rear of No. 6 Governeur Slip. The shed was a light structure, sided with corrugated iron. The establishment, which was a wood alcohol refinery, was closed at 3 P.M., and the boiler, it is said, was left with banked fire and gauge showing twenty pounds pressure. The boiler had been inspected December 9, 1886, and then was in good condition, and was allowed

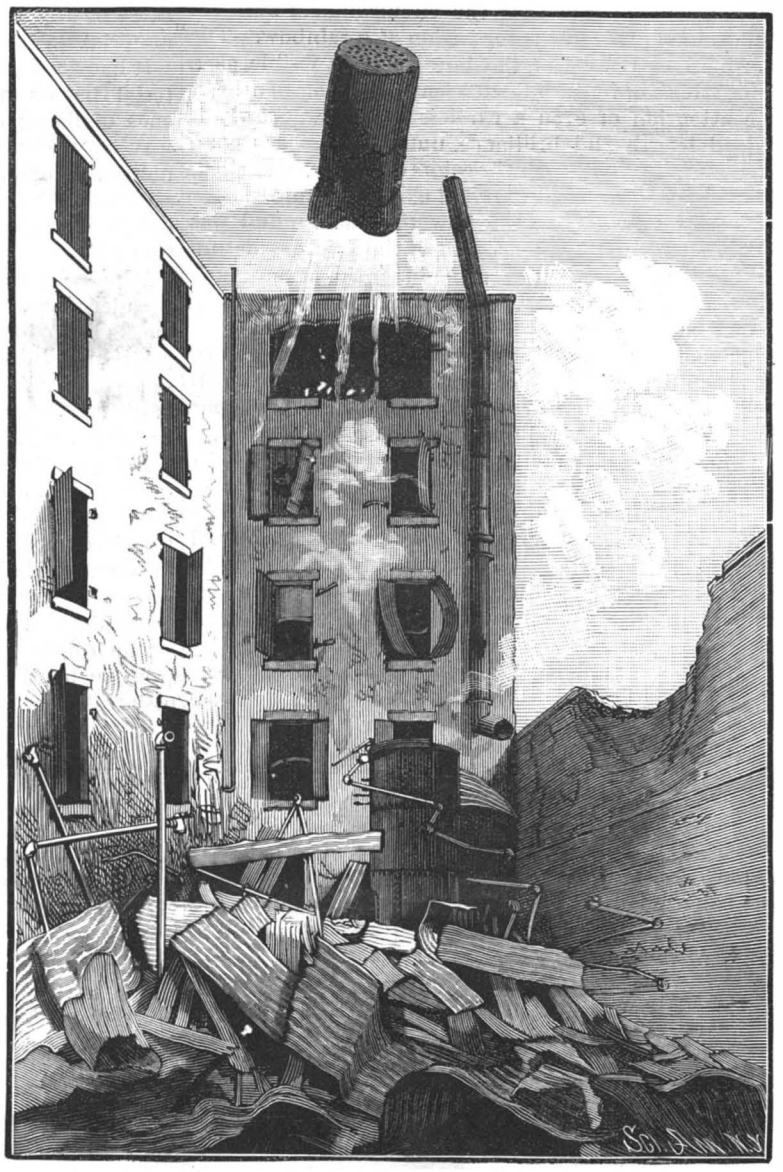
THE EXPLODED BOILER.

to carry 75 pounds of steam. Two hours after the boiler had been left with its fire banked, it exploded.

The iron gave way around the fire box in the legs of the boiler. Under the force of the explosion and of the rush of the steam, it rose like a rocket nearly in a vertical direction, and, about forty feet from the ground, struck the wall of the building. It drove in the wall between two windows, first demolishing the shed in its upward flight. After it struck the building it suddenly changed its direction nearly at right angles, and flew off in the opposite direction. Steam was undoubtedly still escaping and caused its long flight, especially as regards the horizontal component. Rising in its course nearly two hundred feet, it passed over Water and Cherry Streets, and landed in the back yard of a tenement house, No. 194 Monroe Street. The distance from its starting place to its destination is 460 feet. The flight must have been largely due to the reaction of the escaping steam. When the boiler landed no steam appeared, as all had issued from it before it reached the ground.

The immense flight of the entire boiler is most remarkable, but the small amount of injury it did is not less so. The wonder is not only that it managed to escape so well from the yard containing it originally, but also that it fell with such precision in the other yard. A deviation of fifteen or twenty feet in the length of its course would have brought it on the roof of one or the other of two tenement houses, between which it dropped. The effect of two tons of iron going through a crowded house would have been disastrous. As it is, no one was seriously injured, and even the damage to property is slight.

The boiler shows signs of burning around the fire box, where it failed. The lower tube sheet is unburned. The theory of the boiler inspectors is that the door was closed, and the water was low, so that steam generated until the bursting pressure was reached. The door should, of course, have been left open. If the engineer did this, it is probable that some person closed it. It is the first boiler explosion that can be recorded among boilers under city inspection for a very long period of time.

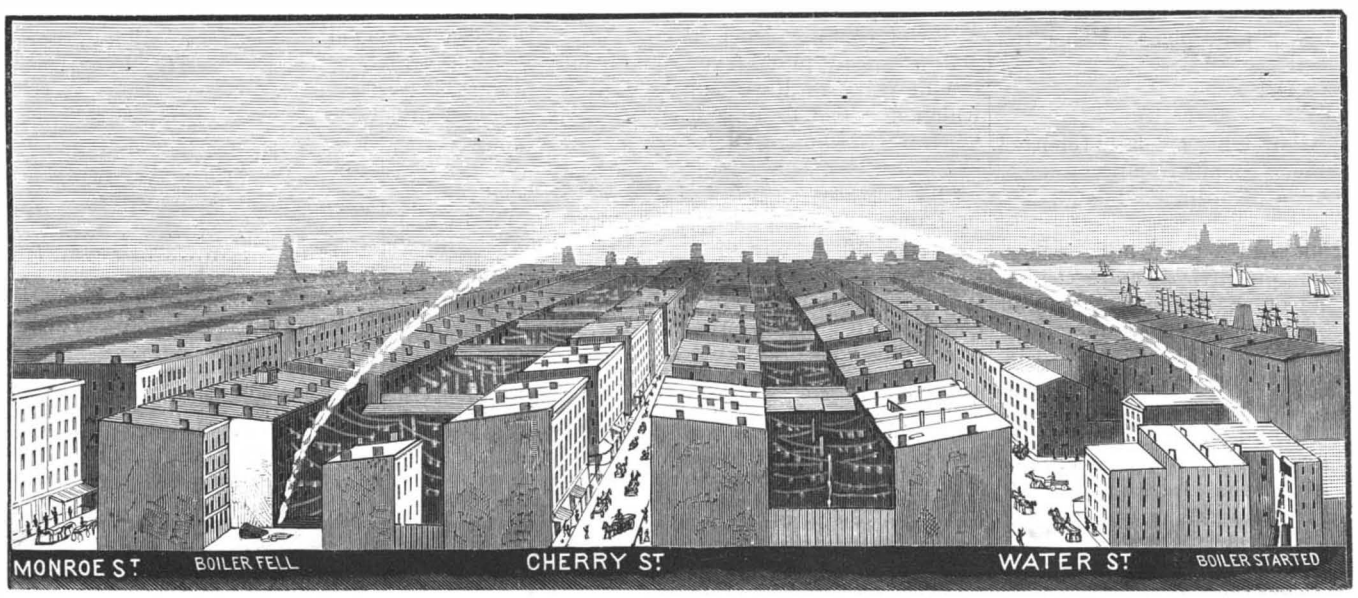


STARTING POINT AFTER THE EXPLOSION.

Lightning Rods for Tall Chimneys.

M. Faraday, in the *Architect and Builder* (London), says the conductor should be of half inch copper rod, and should rise above the top of the chimney by a quantity equal to the width of the chimney at the top. The lengths of rod should be well joined metallically to each other, and this is perhaps best done by screwing the ends into a copper socket. The connection at the bottom should be good; if there are any pump pipes at hand going into a well, they would be useful in that respect. As respects electrical conduction, no advantage is gained by expanding the rod horizontally into a strap or tube—surface does nothing; the solid section is the essential element.

There is no occasion of insulation (of the conductor), for this reason. A flash of lightning has an intensity that enables it to break through many hundred yards (perhaps miles) of air, and therefore an insulation of 6 inches or 1 foot in length could have no power in preventing its lead to the brickwork, supposing that the conductor were not able to carry it away. Again, 6 inches or 1 foot is so little that it is equivalent almost to nothing. A very feeble electricity could break through that barrier, and a flash that could not break through 5 or 10 feet could do no harm to the chimney. A very great point is to have no insulated masses of metal. If, therefore, hoops are put round the chimney, each should be connected metallically with the conductor, otherwise a flash might strike a hoop at a corner on the opposite side to the conductor, and then on the other side, on passing to the conductor, from the nearest part of the hoop, there might be an explosion, and the chimney injured there or even broken through. Again, no rods or ties of metal should be wrought into the chimney parallel to its length, and, therefore, to the conductor, and then to be left unconnected with it. The rod may be close along the brick or stone. It makes no difference. There will be no need of rod on each side of the building, but let the cast iron hoop and the others you speak of be connected with rod, and it will be in those places at least as if there were rods on every side of the chimney. A three-fourth rod is no doubt better than a half inch, and, except for the expense, I like it better. But a half inch has never yet failed. A rod at Coutts' brewery has been put up 1½ inches diameter; but they did not mind expense. The Nelson column, in London, has a half inch rod—three-fourths is better. I do not know of any case of harm from hoop iron inclosed in the building, but if not in connection with the conductor, I should not like it; even then it might cause harm if the lightning took the end furthest from the conductor.



FLIGHT OF THE BOILER.

An Ocean Race.

The steamship Arizona, of the Guion line, and Servia, of the Cunard line, which recently left Queenstown about the same time, arrived at New York within an hour of each other. During the entire voyage the two kept constantly in sight of each other. By night each others lights could always be seen, and at day either the spars or the smoke of one vessel could be seen from the decks of the other steamer. The passengers on the Servia were constantly watching the Arizona, which they hoped to leave behind, while the people on the rival boat regarded the Servia with similar interest. Such close rivalry between ocean greyhounds during a voyage has never occurred before.

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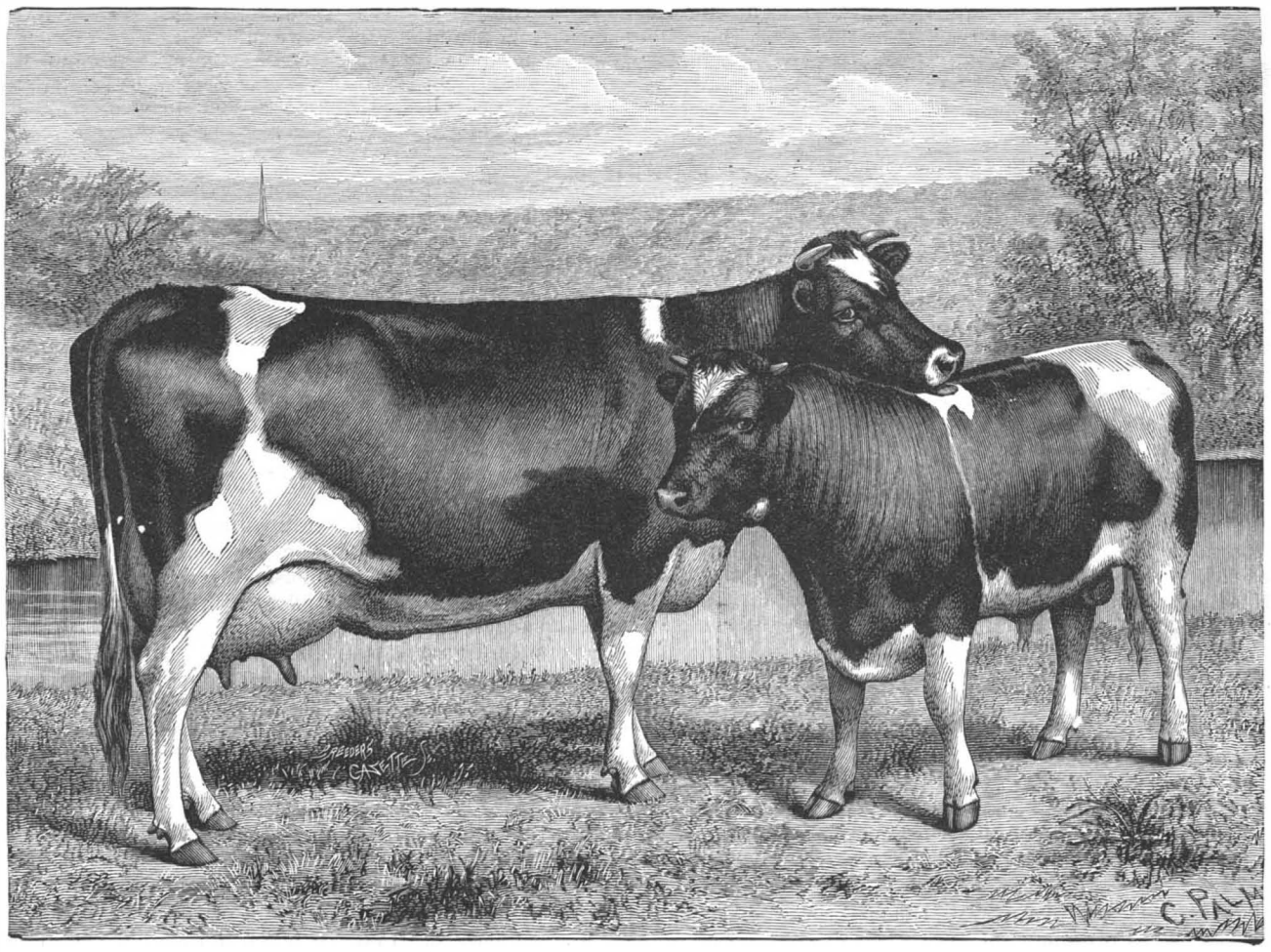
HOLSTEIN CATTLE.

Much confusion seems to exist in the minds of many concerning the Holstein and the Dutch belted cattle, a splendid example of which was published in the SCIENTIFIC AMERICAN a few weeks ago. The difference between the two varieties is quite marked, as may be observed by comparing the two illustrations. The Holsteins were a prominent feature of the late cattle show in New York City, and attracted universal attention. They are wonderful milkers, and although the milk is not of the richest quality, this breed has come much into public favor. The cow in the accompanying cut, Mechtchilde (6,718 H. H. B.), is the property of Mr. F. C. Stevens, of Utica, N. Y., and, as a three year old, she has made a record of 83⅓ lb. of milk in one day, 2,100 lb. in one month, and 9,033 lb. in five months, all of which demonstrates her capacity as a milker. The bull Sir Mechtchilde (3,727 H. F. H. B.) tipped the scales at 1,240 lb. when only twelve and one-half months old.



HOLSTEIN FRIESIAN COW MECHTCHILDE AND BULL SIR MECHTCHILDE.

Le Progres Militaire, in an article on "The Proportion of Artillery," argues that one of the principal causes of the defeats of the French in 1870 was the inefficiency of guns, both in number and material. The new calculations give 17 batteries to each *corps d'armee*, but the Germans are working to furnish each corps with 20 batteries, or 120 guns. The essential tactic of the arm is admitted to be the entry into action of the whole force *en bloc*.

THE TWO GRAY SEALS IN THE ZOOLOGICAL GARDEN IN BERLIN.

The seals' tank in the Berlin Zoological Garden, which was empty for so long, has been occupied since Easter of last year by two young gray seals, which have attracted much attention from zoologists, as well as the general public, forming, in fact, the chief point of interest in the garden.

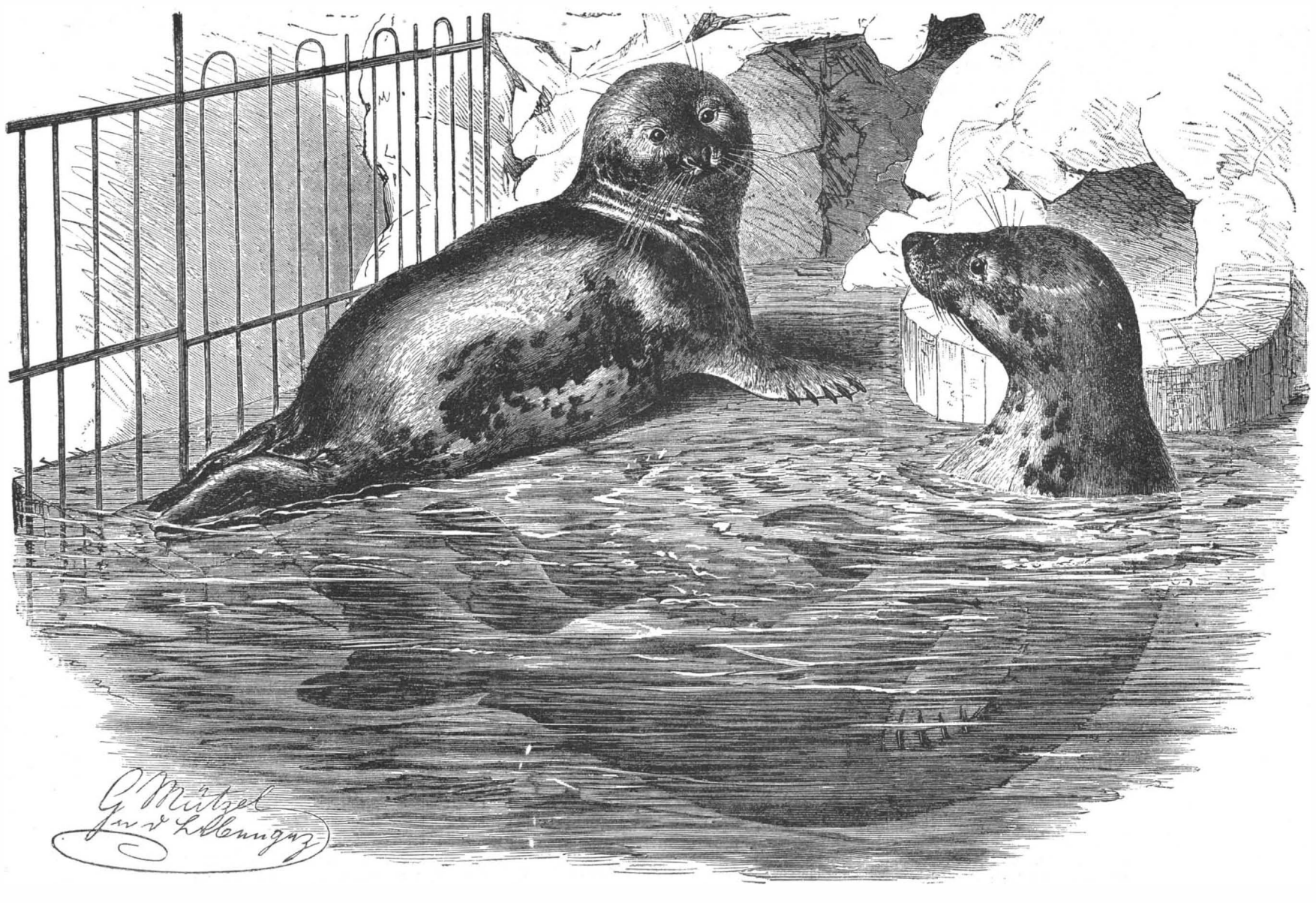
These two seals came from the Baltic Sea. They were caught near Dantzic by Gross-Plehnendorf, and were sold to the garden as common seals, or "sea dogs;" but there can be no doubt that they are two young gray seals.

The gray seal (*Halichorus gryphus*) lives on the coasts of the countries bordering the Baltic Sea, also on the shores of Great Britain, Norway, Iceland, New Caledonia, Labrador, and, perhaps, southern Greenland. They are specially abundant in parts of the Baltic Sea, but are not found in the most frigid regions.

Young specimens of the gray seal may easily be mistaken for the common seal; but old ones, specially males, can be readily distinguished because of their great size. They attain a length of from 8 to 9 feet, and a weight of from 400 to 500 pounds; while the common seal is seldom more than 4 or 5 feet long, and weighs only from 100 to 150 pounds. To a connoisseur there are other points of distinction which are marked; for instance, the shape of the head, the teeth, and the coloring of the fur. In the gray seal the snout forms the largest part of the head, this feature becoming more marked as the animal grows older; but in the seals of the *Phoca* genus the brain is much larger.

The predominating color of the fur is gray—dark on the back and lighter on the belly—with many modifications, according to the age and sex of the creature. The females are lighter in color than the males, and in older specimens the coloring is usually more uniform; that is, less mottled than in the young. With the latter a great number of dark spots are to be found scattered over the gray ground, specially on the neck and flanks, as shown in the accompanying cut. As they grow older, the spots gradually disappear.

It is a notable fact that the gray seals, unlike most



THE TWO GRAY SEALS IN THE ZOOLOGICAL GARDEN IN BERLIN.

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web-footed creatures, do not easily accustom themselves to captivity. In zoological works they are set down as untamable animals, unable to endure confinement. It is known that common seals can easily be tamed. No former attempts, within the knowledge of science, to keep gray seals have been successful. They generally refuse nourishment, try to bite any one who goes near them, and die in a few weeks. At first the two in Berlin refused food, one fasting for about two weeks and the other for three or four weeks, so that they were nearly starved; but finally the instinct of self-preservation triumphed, they took the food offered, and since then they have thrived.

Eels and herrings constitute their favorite food, though they like torsk and shellfish; but they will not eat the many-boned river fish. The herrings and young eels are swallowed whole, while the other fish are torn to pieces with their claws and teeth. While eating, the seals keep their heads and paws above the water, presenting a very droll appearance. When in their native waters, the gray seals eat many mollusks, crabs, etc.

Many people gather at their tank every day toward evening to see them feed, and on these occasions they are very energetic, displaying much elegance of motion. They have learned to take fish from their keeper's hand, but cannot be taught any tricks. They have endured the cold of winter in their element under the open sky, although the thermometer fell some nights to 5° F. It is to be hoped that these animals will long add to the interest of the Berlin garden.—*Illustrirte Zeitung.*

Milk and Scarlet Fever.

At the Royal Institution recently Dr. Klein, the eminent microbist, submitted a paper of the utmost importance in regard to the etiology of scarlet fever. Not long since Mr. Power, a medical inspector of the Local Government Board, investigated an epidemic of scarlet fever which had occurred in the north of London, and which was traced directly to milk supplied from a certain dairy at Hendon. Very complete evidence was collected, which seemed to negative the possibility of infection of the milk from a human source or by insanitary conditions, and Mr. Power further proved that the cows which yielded the milk were in a diseased condition, that the first signs of this disease had appeared in cows which had been recently imported from Derbyshire, and that it spread from them to the other cows milked at this Hendon dairy. The disease consisted in the presence of sores on different parts of the skin, with loss of hair in patches, ulcerations on the udder and teats, and a visceral disease, notably of the lungs, liver, kidneys, and spleen, which, although milder in character, very much resembled the visceral lesions occurring in cases of human scarlet fever. By experiment it was shown that the matter of the ulcers of the udder is possessed of infective power, inasmuch as on inoculation into the skin of calves the same ulcers are reproduced; further it was shown that in the ulcers of the cow there existed in large numbers a species of micrococcus which, on being planted on artificial nutritive media, such as are used for the study of bacteria, produces in a few days a crop of micrococci, possessed of very distinct characters, by which they are distinguishable from other bacteria. When calves are inoculated from a cultivation of this micrococcus, they become after an incubation period affected with a cutaneous and visceral disease the same as the disease of the Hendon cows. Since Mr. Power's investigations Dr. Klein has studied the diseased condition, and his experiments have shown that in the blood and tissues of persons affected with scarlet fever there occurs the same micrococcus as was present in the cow, both being identical in microscopical and in cultural characters. He has also proved that the action of this microbe on animals is exactly the same as the micrococcus found in the Hendon cows. It seems to be fully established, therefore, that this microbe, *micrococcus scarlatinæ*, is the cause of human scarlet fever; that it produces in bovine animals a disease identical with the Hendon disease and human scarlet fever, and that consequently, while the cow is susceptible to infection with human scarlet fever, it can in its turn be the source of contagium for the human species. Dr. Klein has found the same microbe in tins of condensed milk sold under the name of Rose brand. This milk was under suspicion of having produced scarlet fever in a number of persons who had partaken of it. When the microbe of the condensed milk was tested on animals, calves, and mice, it produced the identical disease which was produced by the microbe of human scarlet fever and of the Hendon cows. This Rose brand of condensed milk, Dr. Klein states, is a cheap article, meant for the poorer classes; probably it has not been sufficiently heated in the tins before sealing the latter.

Scientific investigation has, therefore, now made a distinct and very important advance. It is, of course, well known that scarlet fever, as well as diphtheria and typhoid fever epidemics, have been frequently spread by means of the milk supply. The typhoid microbes, indeed, as far as is known, have not been conveyed by the milk itself, but by the water added to it, or, as the milkmen themselves say, by the water used for washing out the cans. It has been hitherto assumed that scarlet fever has been conveyed in milk only by some personal contact from persons who had had the disease or who had been with others who had been so infected. The knowledge now acquired is to the effect that cows themselves suffer from a mild disease identical with scarlet fever, and communicable by their milk to the human subject.

This disease, although hitherto unnoticed by veterinary practitioners, can be easily detected, and is, no doubt, the source of a large proportion of the cases of scarlet fever in this country. From that disease alone an average of 854 persons per million living in the United Kingdom die annually, and some twelve times as many go through the illness. When we remember that many of these deaths, together with, perhaps, most of the typhoid and probably some of the diphtheria epidemics, are due to carelessness or ignorance at the dairies, the conclusion that some efficient system of control of our milk supply is called for seems inevitable. Out of consideration for public safety, the legislature has rightly shown itself anxious in regard to the sale of poisons; but for hundreds slain by poisons, tens of thousands die from unwholesome milk, and a proper system of official supervision of the milk trade is therefore one of the most urgent of hygienic requirements.—*Chemist and Druggist.*

Prizes for an Improved Saddle.

Two prizes, of 6,000 marks ($1,500) and 3,000 marks ($750) respectively, are offered by the German government for the best pattern of a saddle for the cavalry. The conditions are briefly as follows: 1. It must afford an easy and natural seat to the trooper. 2. It must not in any way impede his movements. 3. It must be simple in construction. 4. It must be serviceable. 5. It must be light. All patterns heavier than the Hungarian saddle at present in use are condemned in advance. It must, moreover, be cheap, and be so constructed that the various articles of equipment—mantle, carbine, *sac a fourrage*, etc.—may be easily carried. The German military authorities reserve to themselves the right of subjecting the patterns sent in to any desirable tests, and of manufacturing a certain number of those selected, to be distributed to the army for trial, without any payment to the inventor. The pattern must be sent in before November 30 next, and the result of the competition will be published in the *Armee Verordnungsblatt* and other journals in October, 1888.

The most curious thing about this proposal is the paltry sum offered as a prize; this, indeed, is the trouble in nearly every case where new inventions are called for. Whether it is a great government or a large manufacturing concern, the idea seems to prevail that it is a piece of generosity to offer $1,500 as a prize to an inventor who will produce and surrender a new invention worth, perhaps, a million dollars in cash. Suppose, in this case, a man should produce a military saddle more easy, more free, simpler, two to five pounds lighter, and one or two dollars cheaper than the common saddle, would not such a saddle be worth half a million dollars, at the least calculation, to any government? The offered prize of $1,500 is far insufficient.

Attend to Your Horses.*

When a horse refuses to drink, and coughs after swallowing a little, it indicates sore throat or swelling of the glands of the neck. It is one of the symptoms of distemper, which is prevalent at this season. Give the horse a warm bran mash, with one drachm of chlorate of potash in it, daily for a week or ten days. There is nothing serious to be apprehended.

For a horse which is weak in the knees, rub the limbs briskly with a woolen cloth, then bathe with salt and water, wipe dry, and apply a mixture of one pint of alcohol and one drachm of tincture of Spanish fly, rubbing in a tablespoonful twice a day with the hand. Let the horse run in a loose stall, deeply littered with sawdust or dry swamp muck, or on an earth floor. Skunk's oil, beef brine, and other trash of the kind are useless.

Piles are caused by dilatations of the blood vessels of the lower gut or rectum and the formation of tumors. In horses they are rare, and melanotic tumors on the lining membrane are often confounded with them. The treatment is as follows: Give daily three ounces of Glauber salts and common salt; also, bran and linseed mashes, with one drachm each of sulphate of iron and ground gentian root. If the piles appear outwardly, or there is much irritation, and the horse rubs the tail, inject one ounce of a solution of a drachm of sugar of lead in a pint of water.

A horse can be fed on grain and bran, if he is not overfed. These foods are concentrated, and need to be given with caution. Cottonseed meal is not a safe food, but the whole seed, if quite free from lint, may be given in moderation. Some coarse fodder is desirable, if it can be procured, and a supply should be grown either of millet, corn fodder, or pea vines, and cut when in blossom and cured for hay. If a little roughness is given, six pounds of bran and the same of some kind of grain, and two pounds of whole clean cottonseed would make sufficient food for a thousand pound horse. Five pounds of hay daily given with this grain would be quite sufficient.

Green food in the summer is often the cause of serious indigestion, with its common results—colic and rupture of the stomach, which is inevitably fatal. Such food should never be given wet, or heated by fermentation after cutting, or in excessive quantity, nor when a horse is weary. Clover or rye should be cut after the dew is off and before the heat of the day, and spread in the shade to wilt, or in the afternoon, and left to wilt until the next day. A sprinkling of salt will tend to avoid trouble with such food, as it prevents fermentation.

Water should always be given before feeding, and never immediately afterward. Colic is often produced by copious watering soon after eating, and also by watering when the animal is hot and weary from work. The stomach being chilled is for the time incapable of digesting any food. Light feeding is to be given during hard or rapid work, and the full feed is only given after sufficient rest. Overfeeding is to be specially avoided, and regularity is very important. One 12 quart pailful of cut hay and four pounds of meal is a full feed for a thousand pound horse, given twice a day, with an equivalent feeding between of oats or corn and long hay. Orchard grass hay, cut just at the blossoming, is excellent for horses. Ripe timothy is the next best, and corn blades, pulled green and well cured, make as good feed as any. Dusty or mouldy food is to be specially avoided, not only for its effect upon the digestive organs, but for its evil results upon the respiratory functions. Idleness is conducive to indigestion, and during the present season particularly horses should be turned out several hours for exercise every day.

The shrinkage of the muscles of the shoulder, and which is commonly called "sweeny," is due to some lameness of the foot or limb, which induces the horse to favor the shoulder and throw the muscles out of use. This inaction causes the muscles to decrease in substance, and the shoulder flattens or becomes hollowed. The remedy for this disfigurement is to relieve the lameness and restore the shoulder to proper activity. The seat of the trouble may be in the shoulder, which may have been sprained. If this is the case, pressure with the knuckles on the shoulder will show it; if not, it will most probably be found in the foot or the pastern joint. Navicular disease is the most frequent cause of this shrinking of the shoulder muscles. This disease is indicated by the animal pointing the toe of the foot forward, and by going lame at starting and soon recovering. Driving fast down hill is the usual cause of trouble with the shoulder by injury to the joint or to the feet.

* These hints on the care of horses we find in the *Ohio Valley Journal.* The information seems practical, and accords so well with our experience in the care of horses that we are sorry not to be able to give the unknown writer of the article full credit.—ED.

Wages in 1800.

The condition of the wage class of that day may be well examined; it is full of instruction for social agitators. In the great cities unskilled workmen were hired by the day, bought their own food, and found their own lodgings. But in the country, on the farms, or wherever a hand was employed on some public work, they were fed and lodged by the employer and given a few dollars a month. On the Pennsylvania canals the diggers ate the coarsest diet, were housed in the rudest sheds, and paid $6 a month from May to November, and $5 a month from November to May. Hod carriers and mortar mixers, diggers and choppers, who, from 1793 to 1800, labored on the public buildings and cut the streets and avenues of Washington City, received $70 a year, or if they wished, $60 for all the work they could perform from March 1 to December 20. The hours of work were invariably from sunrise to sunset. Wages at Albany and New York were 3 shillings, or, as money then went, 40 cents a day; at Lancaster, $8 to $10 a month; elsewhere in Pennsylvania workmen were content with $6 in summer and $5 in winter. At Baltimore men were glad to be hired at 18 pence a day. None, by the month, asked more than $6. At Fredricksburg the price of labor was from $5 to $7. In Virginia white men employed by the year were given £16 currency; slaves, when hired, were clothed and their masters paid £1 a month. A pound Virginia money was, in Federal money, $3.33. The average rate of wages the land over was, therefore, $65 a year, with food and, perhaps, lodging. Out of this small sum the workman must, with his wife's help, maintain his family.—*McMaster's History.*

Gas Wells near Montreal, Canada.

It is said that a large vein of gas has been struck, at a depth of 490 feet, at Louiseville, a small town on the north shore of the river St. Lawrence, sixty miles below Montreal, and that another well two miles below Montreal also shows a large reservoir of gas. A Quebec company has been incorporated to put down wells within the supposed gas-bearing district and furnish the gas for manufacturing and domestic use.

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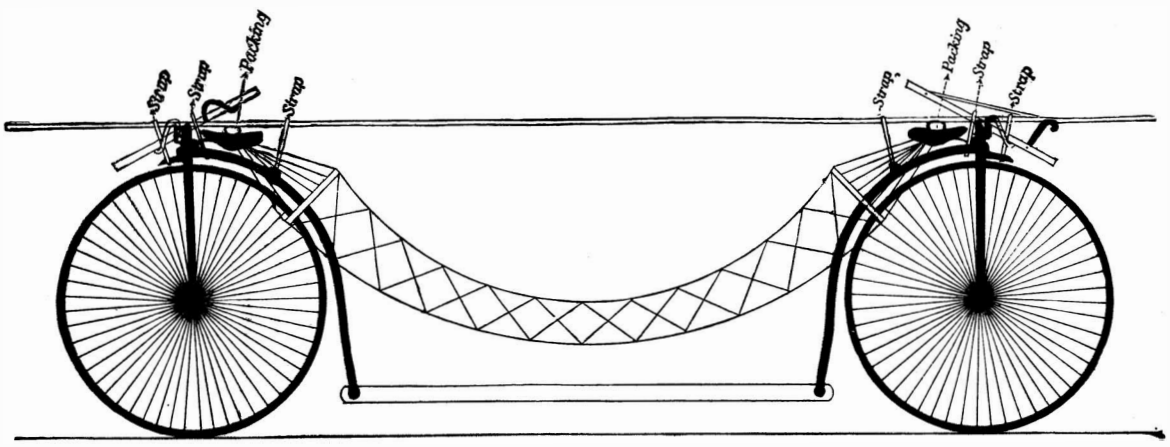
BICYCLE AMBULANCE.

Mr. J. E. Whiting gives, in *Indian Engineering*, a sketch of an arrangement for an ambulance, which consists of the chief parts of two bicycles from which the trailing wheels and the treadles have been removed. A bamboo is very securely strapped to the trailing or curved bar and lies above the bicycle seats—holes being made in the under surface of the bamboo, so as to admit the projecting pins or pivots* over each wheel. The bamboo then keeps the upper parts of the wheels apart at a suitable distance, to admit a hammock, which is attached to the bamboo by its ropes and has its ends resting on the two seats of the bicycles.

The tails of the bicycles are turned toward each other, and two light teakwood rods are attached to the jaws of these tails, one on each side, by the bolts or axles of the (omitted) trailing wheels; these bars keep the lower parts of the structure rigidly apart. Two cross bars are strapped to the handles of the bicycles and pass under the longitudinal bamboo. The cross bar over the rear wheel has two light iron rods with hooks attached to it; these hooks fit into eyes or staples in the longitudinal bamboo, as shown in the sketch, and so as to keep the rear wheel in plane with the bamboo, the iron frames, and the teakwood rods. The front wheel with its cross bar is free to turn about a vertical axis, as usual, in order that the ambulance may take curves and be guided. Four men with a little training run the ambulance easily and safely; they must each hold the central bamboo with one hand and grasp the end of a cross bar with the other, and they can tilt the wheels to one side, when they admit or let out the invalid from the hammock.



BICYCLE AMBULANCE.

Should this form of ambulance prove suitable for hospital or field service, plain stretchers or hammocks with stiffened sides could, of course, be used, and could be slung over easier springs than those under bicycle seats; but the wheels can only be used as wheels over smooth ground and should be as small and light as possible, so that the men could lift the ambulance over obstacles and over rough ground, or when they have to turn sharp corners.

THE NEW NORDENFELT SUBMARINE BOAT.

Although the official trials have not yet taken place, the representative of the *Engineer* at Constantinople tells us that enough has been done in the way of displaying the peculiar qualities of the Nordenfelt submarine boats recently constructed for the Imperial Ottoman government to show that they are very successful realizations of the ideas of their talented inventor. The No. 2 boat lately was submitted to an ordeal that could not possibly have been rendered more severe as a test of her steaming and steering powers, or as a trial of the nerves of those in charge. To gratify the curiosity of his Imperial Majesty the Sultan, orders were given for the boat to maneuver off Seraglio Point, as the most convenient locality for having her under observation during the whole of her runs. It is not often that his Majesty finds himself near the water, his tastes being more military than naval; but the day in question, the 15th of Ramazan, is one of the most sacred in the Islamite calendar, and the Sultan, in the performance of a high function connected with the caliphate, has to spend many hours on the site of the old palace of the Byzantine emperors. After the performance of the religious duties of the day, an aide-de camp was dispatched in a steam launch to summon the Nordenfelt. She had been lying meanwhile alongside the dockyard wall, high up the Golden Horn. The fires were banked, but the required pressure—150 lb.—was in the reservoir, the water having been heated up overnight. This, it may be mentioned, would be the normal condition of these boats during war.

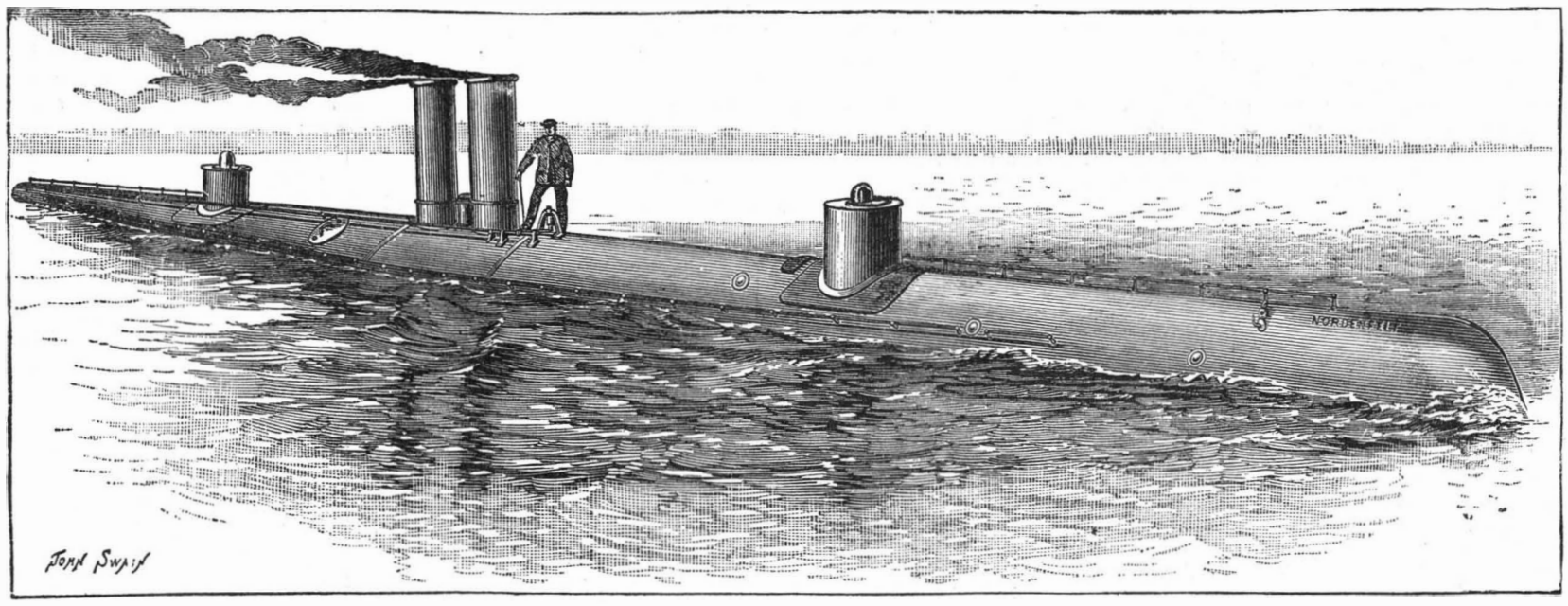
The water once heated up can be maintained in the requisite condition for any length of time by a daily expenditure of from 2 cwt. to 3 cwt. of coal. The loss of heat by radiation is very small, owing to the special protective coverings of the boilers, and the pressure in the reservoir does not fall more than 10 lb. in the twenty-four hours. The boat is thus always ready for the submarine part of the business, and can be got under way for general work as speedily as any other sort of steam craft.

At 2:30 P.M. a loud murmur of admiration and surprise arose from the old bridge at Galata, heralding the approach of the Nordenfelt. She came down the Golden Horn at a rapid rate, threading her way skillfully between the lighters and caiques that would persist in keeping their course in spite of the pilot launches, and shot the bridge without slackening speed—no easy feat considering the narrow width of the opening and the adverse set of the current which sweeps across it. Thousands of spectators were collected on the bridge, as also at Seraglio Point, and many others were afloat in caiques. It was amusing to hear the comments on her appearance. The "whale ship" was conferred upon her as a name by the general verdict, and it certainly seemed most *apropos*, as little was to be seen of her above water but the dome and upper part of the torpedo tube, which might easily have been taken in the distance for the hump and fin of some great denizen of the sea.

In obedience to the orders of the Sultan, who himself directed the maneuvers from the shore, the boat lay for some quarter of an hour, in the very strength of the current, off Seraglio Point. She maintained her position with the greatest ease by a few turns of the screw, while the attendant launches found it impossible to stem it. While in this position she narrowly escaped serious injury, owing to the traffic. A large lighter crossing the stream, and hugging the wind to save ground, passed too close and was struck by the screw. Fortunately she was empty, and so it was easy to get at the hole made in her bottom, and she reached the shore in safety. As for the Nordenfelt, a few inches off the end of one of the blades was the only damage sustained. Being directed to attack a steamer lying off the Scutari shore, as a surface boat, the Nordenfelt, turning in a little over her own length, darted across the current. End on, very little was seen of her, and the eye once removed, she was not very readily discovered again, in spite of the direction being known, on account of the absence of smoke and the very light color of the outside painting. Even on the broadside there was little of the hull to be seen while running, on account of the screen formed by the bow wave. She seems to divide the water like a plow, throwing up a bank on either side, thus forming a furrow in which she would have run completely out of view but for the small chimney necessarily kept in place for the maintenance of combustion. As she neared the vessel, two jets of water were suddenly thrown upward to fall in showers of spray. This marked the moment of delivering her attack. The tube doors being thrown open for the release of the Whiteheads, the water rushing in forces out the air through the vent holes at the rear, with the above described effect. At that moment she looked more like a whale than ever, and might easily have been taken by the most knowing Greenlander for a big fish spouting.

Returning to Seraglio Point, she was next directed to run as a surface boat against the current. In this trial for speed, her performance was a remarkable contrast to that of the attendant launches. Instead of keeping their position as pilots, they were soon left far behind. According to the revolutions and distance run in a given time, she did her eight knots over the ground against a current that was running but very little less than five. On her return from this run orders were given for a second attack to be made upon the steamer, on this occasion as a submarine boat. The vessel being at no great distance, she steamed slowly ahead so as to afford time for getting rid of the extra buoyancy, and closing up. Soon there was little to be seen of her but the hump-like dome, and having turned toward the enemy, it was very difficult to keep her view. Suddenly she was lost sight of, to appear, however, shortly afterward rounding the bows of the vessel from the other side. She had, as it were, dived to deliver her blow, and then turned off to avoid pursuit. No jet was thrown up on this occasion, the escaping air losing all force before reaching the surface. The Sultan expressed himself highly satisfied with the performance of the boat. Altogether she was under way over five hours, during two of which she ran under her reserve steam, using the latter also for her return trip up the Golden Horn. On reaching her moorings there was still 90 lb. pressure in the reservoir, so that she could have continued under way for some time longer.

We illustrate, not the Turkish boat, but the Nordenfelt, now lying in Southampton. A description of the Nordenfelt has before been published by us. It will suffice to say here that the Nordenfelt is very much larger than the Turkish boat. Indeed, she is the largest submarine boat ever constructed. Our engraving is from a photograph, and gives an excellent idea of her appearance.



THE NEW SUBMARINE BOAT NORDENFELT.

POLISHED granite is much more durable than hammered granite. Polishing the stone prevents the lodging of moisture and foreign particles on its surface.

*If these do not project, they can easily be added.

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ENGINEERING INVENTIONS.

A car heater has been patented by Messrs. John H. and Spencer W. Snyder, of Richmond, Va. The invention covers a novel combination and construction of parts, whereby, in case of accident, the heater will bend or mash up, rather than become fractured, and thus form vents for the coals, so that they will not be spilled out.

An automatic cut off valve gear has been patented by Mr. John W. Hayes, of Portsmouth, N. H. It consists essentially of a revoluble head carrying a slide, to which the crank pin for the valve rod is connected, a means for regulating the slide being provided, making a novel form of automatic cut off for slide valves.

A railway torpedo placer has been patented by Messrs. John C. F. and Leander K. Rishel, of Danville, Pa. It consists of a staff having a chambered ferrule with branched and notched arms in its lower end, with a plunger and spiral spring, whereby a torpedo may be attached to a rail from the rear end of a moving train without stopping.

A car brake and starter has been patented by Mr. Theodor Sanders, of Amsterdam, Netherlands. The brake mechanism is operated by friction wheels on the car axle, and the force expended in applying the brake is stored by accumulator springs, the invention being an improved construction by which this stored energy may be applied to start the car.

An apparatus for heating railway cars has been patented by Mr. John H. Ballard, Jr., of Cohoes, N. Y. It has a heating chamber within the boiler, and a subsequent superheater, a blower attached to the front axle of the tender to supply air to the coil in the heater, and a sealed blower attached to the rear axle to force the heated air to the cars.

A tire gauge for locomotives has been patented by Mr. Lewis Keen, of North McGregor, Iowa. It is a profile gauge for measuring worn surfaces, and has a longitudinally slotted stock with marginal contour along one face corresponding to the original surface, separately adjustable wards passing through the slot, and a clamp for holding the wards in position when adjusted to the worn surface being measured.

AGRICULTURAL INVENTIONS.

A combined cultivator and potato digger has been patented by Mr. Henry C. Moore, of Tama City, Iowa. It has a plow or ditcher shovel formed from a plate of metal, with its rear end slitted or cut, with opposite sides of the slit or cut bent upward, with other novel features, making an implement also applicable for cutting trenches and for other uses.

A plow and grubber has been patented by Mr. Henry C. Moore, of Tama City, Iowa. This invention covers a novel construction, combination and arrangement of parts in a plow designed to do a variety of work in cultivating and reclaiming brush lands, making irrigating ditches, etc., the plow having interchangeable parts variously adjustable.

A stubble cutter has been patented by Mr. Hillery P. Mathis, of Stockton, Ga. The cutting roller has a central annular concave groove and convex drums at the sides of the groove, with cutter blades extending across the central groove and connecting the inner ends of the drums, making an improved machine for cutting rice or other stalks or stubble standing in the field.

A potato digging machine has been patented by Mr. Frank M. Thorn, of Orchard Park, N. Y. This invention covers an improvement on a former patented invention of the same inventor, and provides a construction whereby carrying fingers or rods receive the mingled soil and potatoes turned on them by the plow, and, with an endless wheel, pulleys, etc., they are carried backward and upward and separated.

A stacker for hay or other material has been patented by Mr. David G. Woodworth, of Larkin, Kansas. Combined with an inclined frame is a discharging rake pivoted on the frame, a flat belt secured with one end on the rake, arms secured to the outer cross beam of the slat belt, and rods hinged to the arms, with other novel features, making a stacker designed to be simple in construction and very effective.

A plow has been patented by Mr. William H. Green, of Kingsbury, Texas. Its construction is such that a farmer can, by providing himself with the pole and attachments, readily convert his ordinary walking plow into a wheel plow, by the aid of the hind wheels, axle, and hounds of his ordinary farm wagon, the plow not being liable to choke up with weeds or grass, and being also adapted to work in stumpy and foul land.

MISCELLANEOUS INVENTIONS.

A clevis has been patented by Mr. George W. Vinson, of Mayfield, Ky. The invention covers a simply made device, that can be readily attached to beams of different thicknesses, and in which the draught hook can be easily adjusted at any suitable height to regulate the depth of the plow.

A process of making potassium bichromate has been patented by Mr. William Simon, of Baltimore, Md. It consists in decomposing bichromate of sodium by sulphate of potassium and decomposing chromate of sodium by sulphate of potassium and sulphuric acid, according to a manner specified.

A bridge has been patented by Mr. George W. Coultas, of Calais, Ohio. This invention covers a construction specially adapted for short span country bridges, and provides a novel combination and arrangement of various parts and details for putting up a simple and durable structure.

A door closer has been patented by Mr. Edward H. Brown, of Bayonne, N. J. It consists of a lever pivoted to the door and having a weight arranged at one side of the pivot, with a rod pivoted to the lever above its pivot, and a link hinged to the door post and pivoted to the rod adjacent to the door post.

A wardrobe attachment has been patented by Marion H. Cazier, of Chicago, Ill. The invention covers an improvement on a former patented invention of the same inventor, whereby more than the usual number of garments can be hung in a wardrobe in such way that any desired article can be readily removed.

A gate latch has been patented by Mr. Theodore P. Skellenger, of Morristown, N. J. It consists of a rotating bar fitted in the gate and bent to form a handle at one end and a catch at the other, opposite the handle, together with a latch plate attached to the gate post and formed with inwardly projecting lips.

A dumping cart has been patented by Mr. Nicholas F. Reilly, of New York City. This invention relates to carts made of sheet metal, that tilt bodily with the axle, to which the thills are connected by hinge joints, and provides a construction affording extreme lightness and economy with great strength and durability.

An end gate fastener has been patented by Mr. John L. Hanmer, of Burlingame, Kansas. The invention consists of a spring attached across the end gate near its top, with a device for holding and locking the gate in place which is simple and durable in construction, and permits of removing the end gate quickly.

An end gate for wagons has been patented by Mr. John B. Bunten, of Burk, Iowa. It is designed to provide lumber wagons having a box top with a gate which may be set on a level with the wagon bed and used as a platform or extension thereto, being adjustable to various angles, and adapted to be locked and sustained in such positions.

A chair bottom has been patented by Mr. Edwin T. Wade, of Wesson, Miss. It has wires inserted in the frame and extending across the opening thereof at different angles, crossing at the center of the seat, with a central disk adapted to inclose the crossed portions of the wire, the frame of the chair bottom being preferably made of wood.

A flock machine feeder has been patented by Mr. Hayden M. Truesdell, of West Stockbridge, Mass. It consists of a series of flanged rollers mounted to extend across the bottom of a feed box or hopper, a stamp or plunger being arranged to force the stock to the flock machine in such quantities as may be required for the proper operation of the machine.

A clock winding mechanism has been patented by Mr. Abe Robinson, of Brooklyn, N. Y. It consists of a wind wheel actuating a train of gear wheels connected with the spring barrel of the clock mechanism, with an automatic wind wheel locking device, making an automatic winding mechanism for clocks actuated by springs.

A washing machine has been patented by Mr. Hiram Lawrence, of Salem, Oregon. It has a revoluble cylinder mounted in movable bearings, fitted to a tub, with gearing for imparting rotary motion to the cylinder, for washing the clothes without pounding or friction, and without the direct application of the hands to the articles being washed.

A hat hook has been patented by Mr. Augustus H. R. Guiley, of South Easton, Pa. It consists of a hook having a loop and a free end, with a ribbon or cord fixed to the hook, and a fastener held to the other end of the ribbon and passed between the hat body and sweat band, and bent from the ribbon between the body and band.

A suspension harness rack has been patented by Mr. Walter H. Robinson, of Fargo, Dakota Ter. It is particularly adapted for suspending harness from the ceiling of a carriage house, barn, etc., so that all parts of the harness may be conveniently hung and readily manipulated and cleaned, a covering being also provided to protect the harness from exposure.

A moistening partition for tobacco cases has been patented by Mr. Charles N. Swift, of New York City. It is a hollow, porous partition, adapted to receive a sponge or similar substance to be kept moist, and so made as to prevent the stock from coming in contact therewith, and from becoming wet from any drip or water that may be pressed out.

A shaking apparatus has been patented by Mr. Charles Collins, of Doctor Town, Ga. (present address, 408 West 23d Street, New York City). It is designed to mix fancy drinks, such as lemonades, punches, etc., furnishing therefor an apparatus intended to be ornamental and attractive in a bar room or other public place, for quickly and efficiently mixing drinks.

A bedding protector has been patented by Mr. Benjamin L. Holladay, of near Holladay, Va. It consists of a vessel having in its upper surface elliptical grooves and apertures, with a mattress of open yielding material covering the surface, making an auxiliary bed for use with young children, whereby the bed or cradle clothing will be kept dry and clean.

A roller attachment for boats' gunwales has been patented by Mr. Perry S. Katsenys, of Astoria, Oregon. It is to facilitate paying out and hauling in nets without friction or wear, a divided sectional gunwale having slotted plates, one at each end of the opening formed by its division, and a roller with its journals being let into the slots of these plates.

A discharge mechanism for vacuum pans has been patented by Mr. Richard G. Peters, of Manistee, Mich. It is for removing the precipitate in salt and other vacuum pans. The forcible discharge is effected automatically when a carrier is driven by power, means being provided for maintaining a vacuum and obtaining it when lost.

A chain wrench has been patented by Mr. William H. Brock, of Brooklyn, N. Y. This invention covers a novel construction of chain wrenches and the form of yoke or dog to be used therewith, the strain of the dog being distributed over several spurs of the chain, and slots in the arms of the dog allowing of considerable latitude of motion.

A tuning peg retainer has been patented by Mr. Frank B. Converse, of New York City. It consists of a spring fitted to the peg and formed with gripping teeth or serrations, the spring also having frictional resistance against walls of a chamber through which the peg passes to hold the peg where it is set, the invention being especially applicable to violins, banjos, guitars, etc.

A stump puller has been patented by Mr. Charles Sauer, of Easton, Md. It consists of a frame formed in sections, with connections for uniting them, fastenings to secure the frame to the base, journaled shafts geared together in the frames, an anchor guy, and other novel features, the apparatus being also adapted to move houses, rocks, and other heavy objects.

A machine for coating paper with sand, emery, etc., has been patented by Mr. Henry Slusser, of York, Pa. It has a roller journaled in a trough, and a roller journaled in the free end of a hinged frame resting upon the roller in the trough, with other novel features, whereby paper may be coated in long lengths, first with glue, and then with an abrasive material.

A machine for making wire rope has been patented by Mr. Robert S. Newall, of Gateshead, Durham County, England. The invention covers a novel construction, combination, and arrangement of parts in a machine in which the wires from each strand frame are kept separate, without torsion, and in separate strands or sets round a core, without being laid or twisted together, with various other novel features.

An attachment for squares has been patented by Mr. Jabez Klif, of Fergus Falls, Minn. The invention consists of a square and two slotted straight edges adapted to be fastened on the square by means of bolts, with various novel details and combinations of parts, making an improved measuring instrument, especially adapted for the use of carpenters, stair builders, etc.

A shutter fastener has been patented by Messrs. Alexander Cochard and Joseph Gano, of New York City. The invention relates to that class of window blind and shutter fasteners in which two lever hooks project beyond the ends of a cylinder or case fitted within the blind or shutter, one engaging with a fastening on the window sill and the other with a fastening in the wall to hold the shutter.

A curry comb has been patented by Mr. Samuel Norwood, of West Greene, Ala. It consists in a frame having longitudinal bars and series of comb teeth supported by a yielding frame, an adjusting screw being swiveled to the swing frame supporting the comb teeth, with a removable support for the adjusting screw, making a curry comb with yielding teeth which may be projected more or less.

A pump has been patented by Mr. Harry G. Bott, of Thomasville, Pa. It has a compound pitman made in two sections, lapped or extending past each other, with locking devices and a single lever handle extending across both sections of the pitman at their lapped ends, being especially adapted to be operated by a wind wheel, and also to be operated by hand without disconnecting it from the wind wheel.

A bread raiser has been patented by Mr. Charles J. Walthall, of Petersburg, Va. It consists of a receptacle made of poplar or other sweet wood, with a detachable lid which may be used as a dough tray, the door of the receptacle having a glass pane in alignment with which is a thermometer, and its bottom consisting of an air tight metal tank provided with water, beneath which is placed a lamp, there being also air openings in the ends of the receptacle.

A telegraph key has been patented by Mr. Alphonso S. Keating, of Corry, Pa. It has a switch for diverting the main line circuits from the contact points of the key, and at the same time allowing the current to pass through the key to the sounder and the earth, affording means for cutting off the current from the main line when the line is not in use, and allowing signals to be sent over the line from any station when desirable.

An adjustable socket for mortars has been patented by Mr. Edmund G. Purdy, of Ballston Spa, N. Y. It consists of a ring made in segments adapted to be drawn together or separated, so as to bring them into engagement with the outer surface of the mortar, the socket to be then secured to a counter or other support, whereby mortars of different sizes may be held while employed for pulverizing or triturating substances.

The laying of continuous electrical conduits forms the subject of a patent issued to Mr. Alexander C. Chenoweth, of New York City. The method consists in wrapping a core spirally with a casing, suspending the casing in a trench, then pouring and forming a conduit of plastic material around the casing, and withdrawing the core and afterward the casing, the conduit being preferably of asphaltum or other concrete, the core of wood, and the casing of wire or rope wrapped spirally.

A brick kiln has been patented by Messrs. Miles Kehoe and Anthony Zilker, of New Albany, Ind. This invention covers novel details and combinations of parts in a furnace, with openings in the bottom of the chamber containing the bricks set up to be burned, such openings being for the admission of heat from the furnace, while openings in the side walls allow of inspection of the progress of burning, and from these side openings covers can be placed over the openings, admitting heated air to the bricks.

A windmill has been patented by Mr. William H. Goff, of Council Bluffs, Iowa. It has a shaft with a wing attached for regulating the position of the vane of the wind wheel, and a wing for regulating the position of the wind wheel, the shaft being mounted independently of the wheel shaft proper, and the latter wing being secured to a tube adapted to revolve with the wheel shaft carrying bracket, the construction throwing the wheel out of the wind when it is too strong and returning it automatically into action when the wind is moderate.

Improvements in velocipedes form the subject of two patents issued to Mr. James R. Trigwell, of Brixton, Surrey County, England. One invention relates to the pivotal joint by which the steering head is connected to the neck, and is chiefly applicable to machines in which the head is chambered at the back to receive the neck on the backbone of the machine. The other invention relates to the handle bars in which the steering is controlled by a transverse handle bar, and is designed to overcome the vibration felt in the hands and arms of the rider when riding over rough roads.

Patents have been issued to Mr. A. K. Owen, of Lake Geneva, Wis., to facilitate the blocking of bill heads, letter heads, etc. Holes are punched in the top of the paper near the edge and the sheets placed on pins, which are a proper distance apart, on a wood or card board. Guards are placed on the head of the board, reaching over the margin of the paper almost to the pins, but far enough from them to permit one sheet to slip out between the guards and pins when the free end is raised up and pulled a very little; but the paper will not come off any other way. This block saves the trouble of gluing, the sheets do not come apart, and when a press copy is desired, there is no glue to stick to the press. One blocker will last a long time, and is designed to be very desirable for printers to furnish to their customers.

The other part of this invention is intended to facilitate the making of school tablets, merchants' bill books, doctors' prescription books, etc. To a wooden head block (which is fastened to the *back* of the book) two hooks are attached. They receive the punched paper, and can be opened to receive more paper, thus making a *perpetual* binder. The punched paper works freely on the hooks, which makes it very desirable for school tablets. A leaf can be taken from any part of the book without disturbing the other leaves. The books or tablets may or may not have a cover like a book. A sheet of carbon is hung on the same hooks with the paper, and after the bill and its duplicate are removed, the carbon is left still in the center of the book and between two sheets. As the leaves are punched near the edge, it is not difficult to jerk them out.

SCIENTIFIC AMERICAN BUILDING EDITION.

JULY NUMBER.

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TRANSACTIONS OF THE WAGNER FREE INSTITUTE OF SCIENCE. VOL. I. EXPLORATIONS ON THE WEST COAST OF FLORIDA AND IN THE OKEECHOBEE WILDERNESS. By Angelo Heilprin. Philadelphia, 1887. Wagner Free Institute of Science. Pp. vi., 134.

The late William Wagner, a citizen of Philadelphia, is the founder of the institute that bears his name. Since 1855 it has been incorporated. During Mr. Wagner's life his interest in it was personal and unceasing, and dying, he left it well endowed as a permanency, to carry on the work of giving free lectures and carrying on original researches in science. Professor Heilprin, who, by his contributions to recent geological history, notably in the International Science Series, has won considerable reputation, was intrusted with the charge of an expedition to the Florida peninsula. In the present report the account of his work is given, together with illustrations and identifications of the fossil shells. The plates of the shells are produced by autotype, and are beautiful examples of such work. The entire report, on heavy paper with wide margins, has the aspect of an *edition de luxe*. The general conclusions as to the history of the Florida peninsula are of much interest and novelty. Professor Heilprin pronounces it to belong exclusively to the tertiary and post-tertiary periods, and hence to be the youngest portion of the United States. Its growth he declares to be almost entirely due to sedimentary causes and upheaval. The hypothesis of a coral formation of the entire peninsula is unhesitatingly rejected. The northern half of the State represents a deep-sea formation, while deposition from shallower waters is indicated for the southern territories. Upheaval seems to have been very gradual and even, as little disturbance of the strata can be discerned. A plea for evolution is drawn from the fossils discovered, and relics of ancient man are noted as having been found on Sarasota Bay. In addition to the plates of shells, a few landscape plates of the regions explored give variety to the book. It is altogether, both in matter and form, a credit to Professor Heilprin and to the Wagner Institute.

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

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Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

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(2) W. N. G. asks: What is the thickness of the metal around the powder chamber of a 15 inch gun? And what pressure per square inch would throw a 100 lb. projectile one mile? Also, what amount of powder would produce the above result? A. The thickness of metal of guns depends largely upon the material used and the power required. In steel guns the thickness is about equal to the diameter of bore. The elevation of the gun and strength of powder, whether quick or slow burning, and the length of the gun are all elements in computing pressure and amount of powder required. We refer you for further information to a valuable table of the weight and power of modern guns, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 583, and on steel guns, gunpowder, etc., in SCIENTIFIC AMERICAN SUPPLEMENT, No. 589; also on the new 110 ton guns, in SCIENTIFIC AMERICAN, April 16, 1887. You will find in Chambers' "Practical Mathematics," under the head of projectiles, simple and easy computations for all conditions of gun practice.

(3) G. O.—There is no satisfactory method of camera or polyopticon projection with objects in same position with image. The double glasses interfere with the field and the brightness of the image. For illustrations of camera lucida, see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 393, 380, 420.

(4) R. W. S.—A test of 300 lb. pressure on linen hose, determined by plugging a 50 ft. length at one end and applying a gauge, is not high for the best qualities of such hose. You might easily have reached such a pressure in your hose with 120 lb. of steam in the engine, the pump cylinder having a corresponding smaller area than the steam cylinder. We cannot say how far small leaks might have indicated that less pressure was exerted in the hose than that shown by the gauge, without more exact details; but if the leaks were trifling, you probably had substantially the pressure indicated by the gauge.

(5) R. J. K. desires: 1. A receipt for making a varnish to be used on a paper check. Something that will dry quickly, and will protect the signature. A. The only satisfactory varnish for your purpose is naturally a shellac varnish; but, judging from the specimen sent, a poor quality has been used. You can only obtain better results by the purchase of some good white shellac. 2. How to remove mildew and dirt spots from a rattan carriage body. A. Try Labarraque's solution or bleaching fluid for this purpose. 3. What kind of varnish can I use on it protect it? A. Use a good wearing body varnish, and give it plenty of time to dry.

(6) O. M. H. writes: 1. In drilling a hole in the earth for oil or natural gas, the drill and all irons attached thereto become strong magnets, so that a common pocket knife will adhere and hang suspended. What is the cause? A. It has long been known that striking a steel rod endwise will magnetize it. If it is hard, it will retain its magnetism. The old fashioned fire irons, when constantly handled and thrown into the corner of the fireplace, have been known to become magnetic. The drill point of your boring tool is of steel, hardened. The rod becomes magnetic by the end shock, and the steel end tends to retain it. 2. Can steel cast into tools like the blades of house shears be tempered after they are finished and ready to be put together? If so, how is it done? A. Steel cast into articles of cutlery, if of the proper carbon temper, may be hardened in the usual way. You cannot tell the hardening properties of an otherwise unknown quality of steel without a trial. If the steel is too low in carbon, it can be casehardened.

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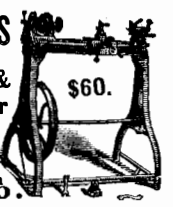

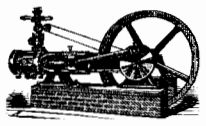

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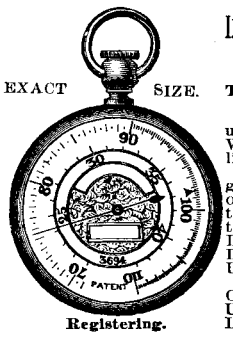

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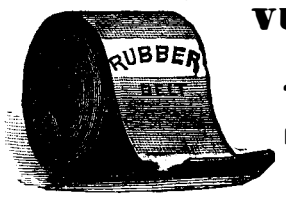

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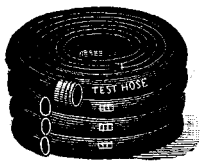

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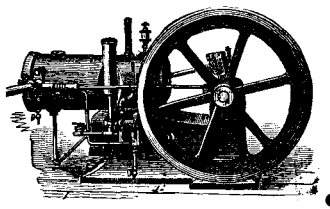
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Proposals for Steel-cast Guns for the Navy.

NAVY DEPARTMENT,
WASHINGTON, D. C., *June* 23, 1887.

Under authority conferred by the act of Congress, approved March 3, 1887, making an appropriation "for the purchase and completion of three steel-cast, rough-bored and turned, six-inch, high-power rifle cannon, of domestic manufacture, one of which shall be of Bessemer steel, one of open-hearth steel, and one of crucible steel," sealed proposals from domestic manufacturers, to furnish the same, will be received at this Department until Tuesday, the second day of August, 1887, at 12 o'clock noon, at which time the proposals will be opened.

Proposals may be made either to furnish three completely finished six-inch, breech-loading, high-power rifle cannon, made from unforged castings, one of Bessemer steel, one of open-hearth steel, and one of crucible steel, or three unforged, rough-bored and turned castings for such cannon, of the same material, respectively, to be finished by the Department in accordance with the bidder's design.

* * * * * * *

No gun or casting for a gun will be paid for until the gun "shall have been completed and have successfully stood the statutory test required by the act of July twenty-sixth, eighteen hundred and eighty-six," entitled "an act making appropriations for the naval service for the fiscal year ending June thirtieth, eighteen hundred and eighty-seven, and for other purposes." [For statement of requirements of said tests, and of other conditions to be observed, reference is made to "specifications" which can be had upon application to the Department.]

Proposals may be made for one or more guns or for one or more castings as aforesaid, * * * [but must be made separately for each gun, or casting for a gun, and upon forms prepared by the Department.]

Each successful bidder will be required to execute, within fifteen days after notice of award, a formal contract in accordance with his proposal, and to furnish a bond, with satisfactory sureties, in a penal sum equal to fifteen per cent. of the amount of his bid, conditioned for the faithful performance of such contract.

Copies of the specifications, with blank forms of proposals, and all additional information desired, can be obtained on application to the Bureau of Ordnance, Navy Department.

All proposals must be in duplicate, inclosed in envelopes marked "Proposals for Steel-cast Cannon," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

The right is reserved to waive defects in form and to reject any or all bids.

WILLIAM C. WHITNEY,
Secretary of the Navy.

NAVY DEPARTMENT,
WASHINGTON, D. C., *July* 20, 1887.

In order to give more time to domestic manufacturers to consider the matter, the period limited for the reception of proposals for steel cast guns is hereby extended, and such proposals will be received, under the foregoing advertisement, as modified, until Tuesday, September 20, 1887, at 12 o'clock noon, at which time the proposals will be opened.

WILLIAM C. WHITNEY,
Secretary of the Navy.

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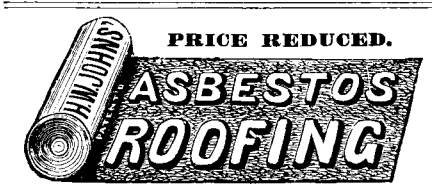

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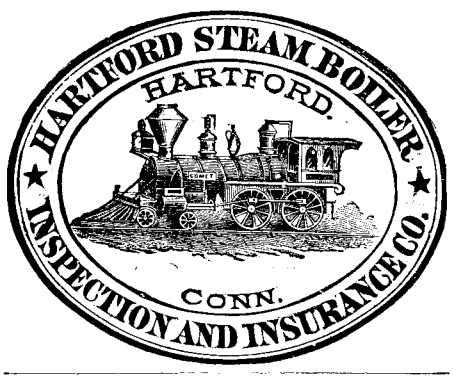

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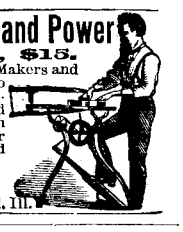

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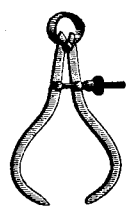

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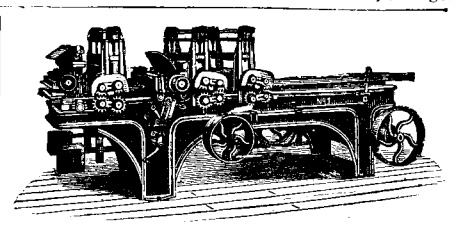

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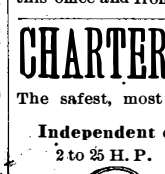

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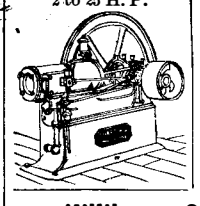

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